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SOME ANOMALIES OF THE ORIGIN OF THE LEFT VERTEBRAL ARTERY

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Although the origin of the left vertebral artery from the aortic arch, or from the left subclavian artery close to the arch, has often been recorded in the literature, these anomalies remain uncommon and worthy of placing on record when encountered.

Material

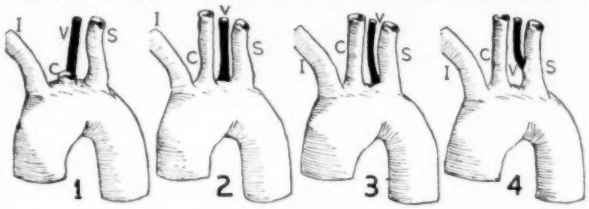
In a small series of 27 cadavers in the dissecting rooms of the anatomy department, University of Cape Town, 4 cases showing such anomalous origins of the left vertebral artery were noted. The series consisted of 13 Bantu males, 3 Bantu females, 5 Coloured males, 4 Coloured females and 2 European females.

Observations

Specimen 1 (Adult Bantu male). The left vertebral artery arises immediately posterior and slightly to the left of the left common carotid artery. It enters the left foramen transversarium of the 5th cervical vertebra (Fig. 1).

Specimen 2 (Adult Bantu male). The left vertebral artery arises between the left common carotid and the left subclavian artery. It enters the left foramen transversarium of the 4th cervical vertebra (Fig. 2).

Specimens 3 *and* 4 (Adult Bantu and adult Coloured female). In both cases the left vertebral artery arises from the left subclavian artery close to the aortic arch. In the Bantu specimen (Fig. 3) the vertebral artery arises from the root of the subclavian artery and enters the left foramen transversarium of the 4th cervical vertebra. In the Coloured specimen (Fig. 4) the vertebral artery arises from the left subclavian artery at a higher level, and enters the 5th foramen transversarium.



Figs. 1-4. Diagrammatic representation of the branches arising from the aortic arch. I= Innominate artery. C= Left common carotid artery. V= Left vertebral artery. S= Left subclavian artery.

In all 4 cases the vertebral artery leaves the thorax through the superior mediastinum immediately posterior to the common carotid artery. In the neck it lies posterior to the carotid sheath, medial to the vagus nerve, and is crossed anteriorly by the inferior thyroid artery. Posteriorly it is related to the longus cervicis muscle before entering the foramen transversarium of a cervical vertebra at a higher level than that of the sixth. The right vertebral artery is normal in these specimens, as are the vertebral veins on both sides.

DISCUSSION

The origin of the vertebral artery from the aortic arch has been divided into 3 main types (Adachi).[1]

Type 1

The right vertebral artery arises from the aortic arch. This variation is extremely rare and was recorded only once in 800 specimens studied by Quain[2] and Thomson.[3] Adachi[1] did not record any in his study of 516 Japanese cadavers, nor did DeGaris[4] or Williams[5] in their comparative studies on the American Whites and Negroes.

Type 2

The left vertebral artery arises from the aortic arch between the origins of the left common carotid and left subclavian arteries. Specimens 1 and 2, described above, belong to this type. It is the commonest variety found, the recorded incidence of which varies from 3·3% to 5·8%, e.g. in the English series the incidence was 5·8% (Thomson[3]), in the Japanese series 4·8% (Adachi[1]), in the American Negro series 3·3% (McDonald and Anson[6]) and in the American White series 3·7% (McDonald and Anson[6]). The incidence in the small series reported here is 7·1%.

Adachi[1] found that in this type (2) the vertebral artery nearly always enters the foramen transversarium of the 5th cervical vertebra, and never that of the 7th. DeGaris,[4] in 8 recorded specimens, found that the vertebral artery entered the foramen of the 5th in 3 cases, that of the 6th in 4, and the foramen of the 7th in 1 case. In this series the vertebral artery entered the foramen of the 4th in the one case and that of the 5th in the other.

The origin of the left vertebral artery from the left subclavian artery, close to the aortic arch, can be regarded as a subdivision of type 2 in which the separation of the origin of the left vertebral from the subclavian has not been completed. This variety has been recorded only 6 times in a series of 1,453 cases.[6] Williams[5] encountered 2 cases in his Negro series and 1 among the Whites, DeGaris[4] found 2 cases (1 Negro and 1 White), while McDonald and Anson[6] found 1 case among the American White. In this series 2 such cases are recorded (1 Bantu male, and 1 Coloured female), representing an incidence of 7·1%.

Type 3

The left vertebral artery arises from the aortic arch just distal to the origin of the left subclavian artery. This variety is rarely encountered and has only been described 6 times in a series of 1,453 cases[6]: 3 times in the Japanese, twice in the American Negro (1 male and 1 female), and once in the American White (male). In all 3 Japanese specimens the artery entered the foramen transversarium of the 7th cervical vertebra.

EMBRYOLOGY

The somatic intersegmental arteries, arising from the primitive dorsal aortae, form a regular series of paired vessels throughout the cervical, thoracic and lumbar and sacral regions in the early embryo. These vessels divide into dorsal and ventral branches which accompany the posterior and anterior primary *rami* of the spinal nerves. The dorsal branches run backwards between the transverse processes of the vertebra

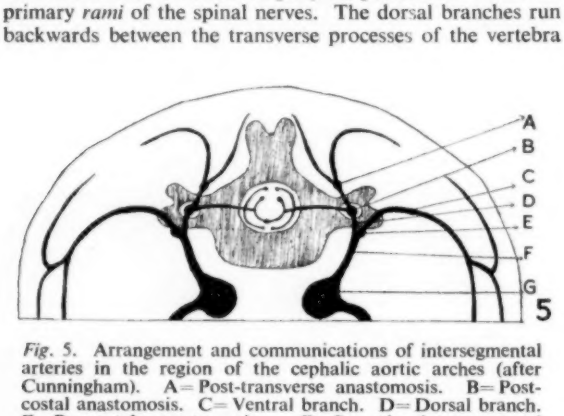


Fig. 5. Arrangement and communications of intersegmental arteries in the region of the cephalic aortic arches (after Cunningham). A= Post-transverse anastomosis. B= Post-costal anastomosis. C= Ventral branch. D= Dorsal branch. E= Pre-costal anastomosis. F= Somatic intersegmental artery. G= Primitive dorsal aorta.

and are connected behind the neck of each rib by post-costal anastomoses, and behind the transverse processes of the vertebrae by post-transverse longitudinal anastomosing channels[7] (Fig. 5).

In the thoracic and lumbar regions the intersegmental arteries persist and form the posterior intercostal and lumbar arteries.

In the cervical region the first 6 pairs of somatic intersegmental arteries lose their connections with the dorsal roots of the aortic arches. The 7th pair, however, persist in their entirety. The first part of the vertebral artery represents the dorsal branch of the 7th somatic intersegmental artery, while the second part—that passing through the cervical transverse processes—consists of post-costal anastomoses between the dorsal branches of the first 7 intersegmental arteries. Padget[8], however, states that the intersegmental artery, accompanying the first cervical nerve, should not be numbered in the cervical series, as has been done in the past, because it does not pass between 2 cervical segments. He suggests that it be called the sub-occipital intersegmental artery, and it thus becomes the transverse suboccipital part of the vertebral artery between the atlas and occipital bone. Numbering the first cervical intersegmental artery as that associated with the second cervical nerve, the artery which becomes a stem of the subclavian and vertebral arteries is the 6th cervical intersegmental artery and not the 7th.

The anomalous origin of the vertebral artery from the aortic arch between the left common carotid and left subclavian artery is thus due to the absorption of the stem of the 7th (6th according to Padget) intersegmental artery into the arch. Thus the vertebral and subclavian arteries come to a rise independently from the aortic arch. Figs. 4 and 3, respectively, show progressive stages in the process of absorption. Figs. 1 and 2 show the ultimate result—the left vertebral artery arising separately from the aortic arch.

SIGNIFICANCE OF THIS ANOMALY

Most anatomists have in the past regarded this anomalous origin of the vertebral artery as a progressive variety and one peculiar to man. Among the many species of primates and other mammals that have been studied, such an origin has only been found among the phoca (seals). In the species of seal known as *Phoca vitulina*, the left vertebral artery normally arises from the aortic arch between the left common carotid and the subclavian arteries. Adachi[1] thus regarded this anomaly as a primitive rather than a progressive variety. Furthermore, the fact that in type 3 he found the vertebral artery in his small series always entering the 7th foramen transversarium, led him to believe that this vessel corresponds to the supreme intercostal artery (thoracic vertebral artery) as found in many mammals.

The practical significance of this anomaly applies to the procedure of ligation of the common carotid artery. An unsuspected vessel, lying behind the carotid artery, may lead to a serious mishap if included in the ligature.

SUMMARY

Four cases of anomalous origin of the vertebral artery from the aortic arch are described, with notes on their classification embryology and significance.

I wish to thank Dr. R. Singer (Senior Lecturer, department of anatomy, University of Cape Town, for his assistance in preparing this paper, and Miss S. Gerardine for preparing the diagram.

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VAN DIE REDAKSIE : EDITORIAL

DIE KOSTE VAN OOP-HARTCHIRURGIE

Met die koms van oop-hartoperasies na Suid-Afrika is dit 'n geleë tyd om die koste van hierdie soort chirurgie te bespreek. Om verskeie redes is die koste betreklik hoog.

Kapitaaluitgawes vir spesiale apparaat is groot. As dit aangeneem word dat 'n hospitaal 'n goed toegeruste torakale-operasiesaal besit, moet daar by hierdie soort werk vir 'n pomp-oksigenatorstelsel en verskeie stukke bykomstige apparaat voorsiening gemaak word. Hoewel die pryse van pomp-oksigenatore wissel van omtrent £1,000 tot £16,000 sou een van die soorte wat op die oomblik meer populêr is, waarskynlik in Suid-Afrika tussen £1,500 en £3,000 kos. Bykomstige apparaat, wat vir die veiligheid van die pasiënt beskikbaar behoort te wees, hoewel dit miskien nie by elke dergelike operasie gebruik sal word nie, sluit die volgende in: Elektriese defibrillator, pasmaker, elektrokardiogram en elektro-enkefalogram (met ossilloskoop), drukmeters vir arteriële en veneuse druk, apparaat vir die ondersoek van die bloedgasse, bloed pH en stollingsmeganismes, en apparaat vir algemene liggaamsverkoeling. Die koste van hierdie bykomstige apparaat kan in Suid-Afrika maklik tussen £2,500 en £4,000 beloop. Buite en behalwe 'n volledig toegeruste torakale operasiesaal sal dus sowat £4,000 tot £7,000 benodig word om oop-hartchirurgie op 'n doeltreffende basis te plaas.

Lopende uitgawes, bv. vir plastiese buise, heparin, protamien en soortgelyke middels is ook aansienlik, maar in hierdie verband is die belangrikste item waarskynlik bloed. Die meeste apparate wat op die oomblik in die mode is, het 2,500-5,000 ml. bloed nodig om die apparaat te vul. Om nog bloed in reserwe te hou vir bloedverlies, wat groot kan wees, word gewoonlik voorsiening gemaak vir 5-15 of selfs 20 bottels bloed, volgens die ouderdom van die pasiënt en die soort operasie. Ongebruikte bloed word gewoonlik nie weer in die bank teruggeneem nie (omdat hierdie gehepariniseerde bloed nie baie lank hou nie) en word gemors. Daar word dus hoë eise aan die bloedbank gestel, en die koste van die bloed vir een operasie kan maklik £20 tot £60 beloop.

Personeelbehoeftes is groter as met gewone torakale operasies. Behalwe die gewone operasiepersoneel (chirurg, twee assistente, narkotiseur, operasiesuster en twee verpleegsters), kan die volgende as die minimum bykomstige personeel beskou word: 'n ‚bestuurder' van die pomp-oksigenator, 'n assistent vir die narkotiseur en 'n assistent vir die operasiesuster. Die ‚bestuurder' van die pomp-oksigenator behoort verkieslik 'n geneesheer te wees, wat die pomp en sy werking goed verstaan en 'n goeie begrip het van die fisiologie en die probleme van die ekstra-korporeale sirkulasie. Een van die persone, of 'n bykomstige persoon, moet in staat wees om die EKG en EEG te vertolk. Daar moet dus 'n groter span wees as wat vir gewone operasies nodig is. Aan die ander kant moet daar gewaak word teen te veel ‚deskundiges'—‚Too many cooks spoil the broth'.

Behalwe hierdie meer opvallende redes vir die hoë koste is daar ander belangrike faktore wat nie uit die oog verloor moet word nie. Op hierdie stadium in die ontwikkeling van die hartchirurgie is spesiale opleiding van chirurge in hierdie tegnieke baie wenslik. Dit moet aan die hartchirurge in Suid-Afrika ter ere na gegee word dat daar uit feitlik elke Universiteitsentrum een of meer van hulle op eie (gewoonlik taamlik hoë) onkoste die buiteland besoek het om hierdie spesiale studie te onderneem. 'n Minder erkende, maar uiters belangrike, aspek van oop-hartchirurgie is die noodsaaklikheid dat operasies op diere die operasies op pasiënte voorafgaan. Die chirurg wat op die huidige stadium 'n oop-hartoperasie onderneem sonder voorafgaande ondervinding van die tegniek op diere, soek moeilikheid vir homself en vir sy pasiënt. Op die huidige tydstip moet sulke diereoperasies nie as eksperimentele navorsingswerk beskou word nie, *maar as 'n onontbeerlike voorbereiding vir die operasie op die pasiënt.* Voorsiening vir sulke fasiliteite behoort dus deur hospitaalowerhede en provinsiale administrasies gemaak te word. Hierdie standpunt word gelukkig deur sommige hospitaalowerhede erken, maar dit verdien meer algemene onvoorwaardelike erkenning deur alle betrokke liggame.

Navorsing op die gebied van die hartchirurgie is natuurlik ook van groot belang en behoort in Suid-Afrika voortgesit te word. Ten spyte van 'n tekort aan tegniese hulpmiddels en gespesialiseerde tegnici in ons land behoort ons onder geen omstandighede te aanvaar dat ons nie in staat is om hier nuttige navorsing op hierdie gebied te doen nie. Suid-Afrikaners wat in die buiteland gewerk het, bv. op die gebied van kunsmatige hartstilstand en op die gebied van kunsmatige kleppe, staan baie hoog aangeskrewe as navorsers op hierdie gebied. As die nodige finansiële ondersteuning vir sulke navorsing beskikbaar gestel word, kan ons 'n nuttige en moontlik selfs 'n groot bydrae op hierdie gebied lewer.

Die ongetwyfeld hoë koste van oop-hartchirurgie kan maklik in 'n valse lig gesien word as 'n onnodig hoë uitgawe om 'n paar ongelukkige enkelinge met aangebore hartafwykings te probeer genees. Hoewel oorspronklik ontwerp en nog grotendeels gebruik vir hierdie betreklike seldsame gevalle, word die oop-harttegniek op 'n toenemende aantal meer gewone verworwe hartletsels toegepas, en dit kan selfs waarskynlik geag word dat in die toekoms die meerderheid van klepletsels van die hart met die oop-harttegniek behandel sal word. Verdere moontlike toepassings vir die tegniek is op pasiënte met akute, maar tydelike, ineenstorting van hart- of longfunksie, bv. as hulpmiddel in

die behandeling van hartinfarksie. Dit is selfs al in die V.S.A. in die bestryding van kanker toegepas. Geld wat nou in die oop-hartchirurgie belê word, is dus nie net bestem vir die behandeling van seldsame ‚gate in die hart' nie, maar sal groot diwidende in die behandeling van allerhande alledaagse hartkwale in die nie baie verre toekoms afwerp. As hierdie saak in die regte perspektief gesien word, is dit die duidelike plig van die geneeskundige beroep, hospitaalowerhede en die publiek teenoor ons hartlyers om te sorg dat die nodige voorsiening vir doeltreffende oop-hartchirurgie en navorsing op hierdie gebied gemaak word. Vir die voorsiening van hierdie fasiliteite is in die eerste plek die betrokke hospitaalowerhede en navorsingsinrigtings verantwoordelik, maar die algemene publiek behoort nie hiermee tevrede te wees nie. Navorsing vereis veral op hierdie gebied baie geld. In die V.S.A. word fantastiese somme geld vir geneeskundige navorsing beskikbaar gestel, en *'n baie groot deel hiervan bestaan uit vrywillige bydraes deur die publiek self.* Hierdie voorbeeld verdien in Suid-Afrika aandag en navolging. Daarom is dit baie bemoedigend om te verneem dat daar wel reeds onder die Suid-Afrikaanse publiek roeringe is om deur middel van 'n Stigting vir Hartchirurgie, of 'n soortgelyke liggaam, geld vir hierdie doel in te samel. So 'n beweging verdien die waardering, dank en aktiewe ondersteuning van die hele geneeskundige beroep. (Kyk ook na die artikel *Experimental Studies in Extracorporeal Circulation using the Helix-Reservoir Bubble Oxygenator* wat ons elders in hierdie uitgawe plaas.)

THE RETICULAR FORMATION

The reticular substance in the brain stem is a continuous meshwork of nerve cells and fibres extending from the corpus striatum through the brain stem and spinal cord. In the mammal the anatomical information is not precise, but those areas in a Weigert section where interlacing myelinated fibres are seen with cells lying in the meshes as reticular neurones are regarded as belonging to this system. Aggregates of cells seen in relatively thick sections of the reticular substance have been regarded by some workers as nuclei and have been used as the basis of subdivision of the reticular formation. The work in recent years has tended to substitute for the older concept of centres in the brain stem a newer importance for the reticular core in the integration, multi-modal activation of units, and behaviour control; in fact the cerebral cortex is stressed as being very dependent on the core. After transection of the midbrain the EEG resembles that of sleep, while rapid repetitive reticular stimulation produces an EEG change called activation; such activation in anaesthetized animals is often accompanied by awakening, alertness, or other signs of enhanced behaviour. Activation of the cortex from the reticular core of the brain stem or from various somatic and visceral afferent stimuli is attributed to a multisynaptic afferent system passing up through tegmentum, mid-line thalamus and hypothalamus to affect the cortex diffusely.

Neuromuscular control is also a function of the reticular core, the bulbar and suprabulbar centres exerting an inhibitory action on spinal flexor and extensor reflex paths. Spinally directed inhibitory fibres are distributed in both lateral and ventral white columns. There is also a facilitatory system in the reticular core of the brain stem which is believed also to act at the spinal level since movements elicited from pyramidal stimulation in the bulb are facilitated by diencephalic stimulation. The facilitatory reticular core is probably not itself tonically active but is controlled from such sources as the fastigial and Deiter's nuclei. Cerebellogenic influences—both inhibitory and facilitatory types—have been traced into the brain stem. Much of the work published on these functions of the reticular core needs cautious interpretation. The functions attributed to the system may only be valid within the range of particular experimental conditions.

Results from clinical studies and implantation of electrodes to stimulate the diencephalon in animals have indicated that sleep regulation is a thalamic function, sleep resulting from active inhibition of all sensation; however, other workers have obtained contradictory results with diencephalic stimulation. Transection experiments also have indicated that sleep is due to the inhibitory action of a sleep centre upon a more caudal waking centre. In another hypothesis it is stated that there is functional de-afferentation during sleep, with tonically active facilitatory impulses maintaining a waking state, and a decrease in the tonic drive causing lessened wakefulness leading to sleep. The emphasis at present is to regard sleep as due to interruption of the stream of impulses which flows rostrally through the ascending reticular activating system.

Activation of the cortex from the reticular core and other afferent sources has been attributed to a multisynaptic afferent pathway, and the same corticipetal path has been shown to be used by adrenergic activation from an adrenergic centre in the rostral reticular core; certain neurones of the central nervous system are nowadays postulated to require adrenaline (and noradrenaline) for their synaptic transmission. A cholinergic centre is also postulated among other cholinergic mechanisms in the brain. The study of the effects of drugs on the reticular core is still in its infancy, and research workers are here engaged in a most complex field.

There is a vast literature on the brain stem and its reticular core, with recent work dispelling the older ideas that the properties of the brain stem were concerned only with lower levels. Today its rostral part at least is regarded as being linked with integration at the highest levels. The literature is admirably reviewed, with an extensive bibliography appended, by O'Leary and Coben.[1]

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S.A. Society of Medical Women. A meeting of the Cape Town Sub-group of this Society will be held on 1 December at 8 p.m. in the Gynaecology Lecture Theatre, Medical School, Observatory, Cape. The Education Group of the National Cancer Association will show 2 films dealing with the early diagnosis of Cancer of the Breast. All medical women are welcome.

EXPERIMENTAL STUDIES IN EXTRACORPOREAL CIRCULATION USING THE HELIX-RESERVOIR BUBBLE OXYGENATOR

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Open heart surgery is in its infancy in South Africa and to date only a few successful open heart operations utilizing total cardio-pulmonary bypass have been performed. Since July 1958 we have been using the helix-reservoir bubble oxygenator[1] in our experimental laboratory and in this paper we present the results of our first consecutive 20 animal experiments.

Our recent experiences in this laboratory, and the experiences of one of us (C.N.B.) at the University of Minnesota Medical School, Minneapolis, during 1956-58, lead us to agree with Lillehei[2] that the helix-reservoir bubble oxygenator is a highly satisfactory oxygenator for use in open heart surgery and that the unsatisfactory results obtained by some workers[3-5] using this apparatus are due to errors in technique, or to unnecessary and undesirable modifications.[6]

In spite of a vast amount of literature on the subject, we have been unable to trace any reference which describes, in detail, certain steps in the preparation and assembly of the oxygenator which we consider to be of vital importance to its proper function. We will therefore describe our technique in detail.

DESCRIPTION OF THE OXYGENATOR

The helix-reservoir bubble oxygenator, as described by DeWall *et al.*[1, 6] has been used in all our experiments (Fig. 1). The plastic components of the oxygenator which are in contact with the blood are made of Mayon*—a pure polyvinyl plastic hose. Three short sections of latex rubber tubing (internal diameter $\frac{3}{4}$ inch) are used in the circuit through the pumps. We have used the sigmamotor pump† model TM2 in the main circuit, and model TM4 in the cardiotomy return circuit. Special highly polished stainless steel connectors‡ are used to connect the various plastic components in the circuit. These connectors are without abrupt shoulders or other obstructions and minimize potential turbulence.

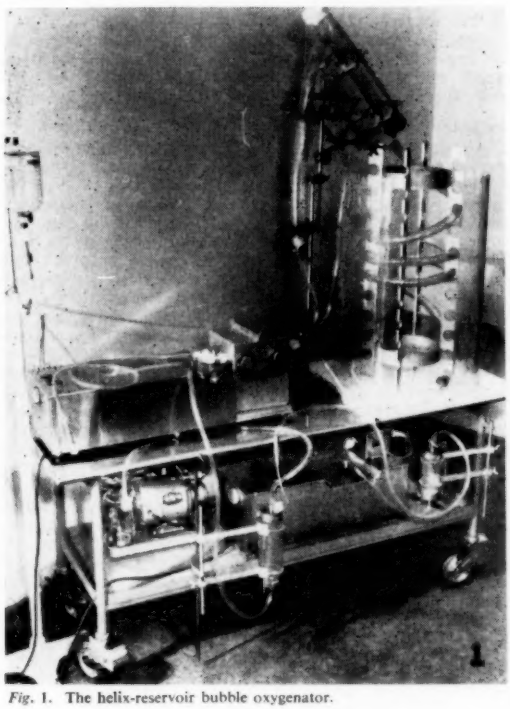

Fig. 1. The helix-reservoir bubble oxygenator.

The components of the oxygenator are connected as shown in Fig. 2. Blood is drained by gravity from both venae cavae into a venous well, which is placed close to the operating table, the bottom of the well being approximately 20 inches below the level

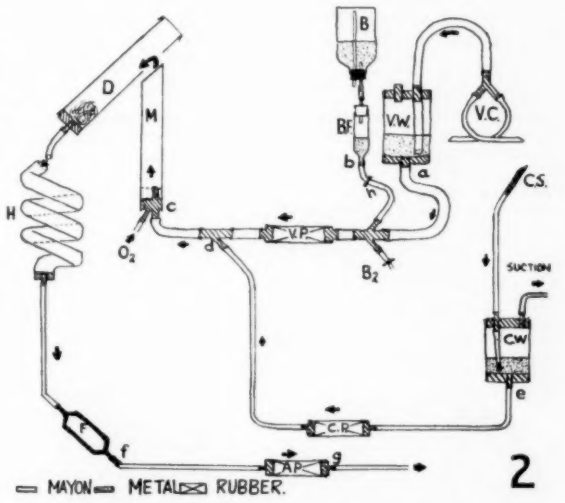

Fig. 2. Diagrammatic representation of the helix-reservoir bubble oxygenator. A.P. = Arterial pump. V.P. = Venous pump. C.P. = Cardiotomy return pump. V.W. = Venous well. C.W. = Cardiotomy return well. C.S. = Cardiotomy sucker. V.C. = Venous catheters. M. = Mixing chamber. D. = De-bubbling chamber. H. = Helix. F. = Double metal filter. B. = Blood bottle. B_2 = Lead to second blood bottle. B.F. = Blood filter.

of the right atrium. The well is adjustable and can be raised or lowered to decrease or increase the venous return respectively. We have, however, rarely had occasion to alter the level of the well during perfusion.

Blood from the venous well is pumped, *via* the venous circuit, into a vertical mixing chamber where it is mixed with 100% oxygen. The oxygen input to the mixing chamber is 3-4 times the blood-volume input, and enters through an oxygen diffuser plate[7] at the bottom of the mixing chamber. The blood-oxygen mixture, owing to the flow of venous blood entering and the flow of oxygen passing upwards, gently rises in the mixing chamber, from the top of which it empties into a de-bubbling chamber.

The de-bubbling chamber lies at an an angle of approximately 20° with the horizontal and is designed to dissipate bubbles and separate the excess O_2 and CO_2 from the arterialized blood. Its walls are coated with a potent non-toxic silicone antifoam substance.π

* Mayon Plastics, 415 17th Avenue North, Hopkins, Minnesota.
† Sigmamotor Inc., 3 North Main Street, Middleport, N.Y.
‡ Phelan Mnfg. Co., 2029 Washington Avenue, So. Minneapolis, Minnesota.
π Antifoam A, Dow Corning Co., Midland, Michigan.

Blood flows by gravity through the de-bubbler and empties into a helix which is wound onto an aluminium stand and placed in a perspex waterbath, the temperature of which is thermostatically controlled between 38°C and 41°C. The helix is made of Mayon tubing with an internal diameter of 1¼ inch, and its length is such that it will accommodate a volume of blood equal to one minute's flow rate plus 400 ml.

The helix acts as a reservoir and, in addition, removes any free gas remaining in the blood. The mechanism of this action was first described by DeWall *et al.*[1] Blood containing free gas is less dense than normal blood and consequently is forced upward by hydrostatic pressure. The lighter blood containing free gas therefore laminates on the upper layer within this tube. As the flow of blood is down the inclined plane of the helix, the heavier gas-free blood descends by gravity beneath the lighter gas-containing blood, forcing it continuously upward. This lamination of the flow is present as long as blood of the two densities is present. After a short flow down the tube the lighter gas-containing blood coalesces and rises upwards, and oxygenated blood, free of excess gas, flows to the bottom of the helical coil.

From the bottom of the helix, blood passes *via* a double metal filter** and thence *via* the arterial circuit to the femoral artery of the subject.

Cardiotomy suction has been used in those experiments in which a ventriculotomy or atriotomy is performed. Blood is aspirated into the cardiotomy well (suction at −30 mm. Hg pressure) and is then pumped by a sigmamotor pump to the venous limb of the main circuit, which it joins distal to the venous pump (Fig. 2).

PREPARATION OF THE APPARATUS

The venous and cardiotomy wells, the mixing and de-bubbling chambers and the helix are assembled before autoclaving, as described by DeWall *et al.*[2] and the helix is marked off into sections with a grease pencil, each section having a volume of 100 ml. The connectors at the ends of these tubes are fixed in position by means of motor-car radiator hose clamps. The clamps are loosely applied before autoclaving and finally tightened when the oxygenator is assembled. The exposed ends of the stainless-steel connectors are each covered with cotton gauze which is held in place by elastic bands.

The upper end of the mixing chamber is covered with cotton gauze, held in place by means of autoclaving tape; this covering is applied in such a way that it can be removed without contaminating the upper end of the mixer (Fig. 3). The upper end

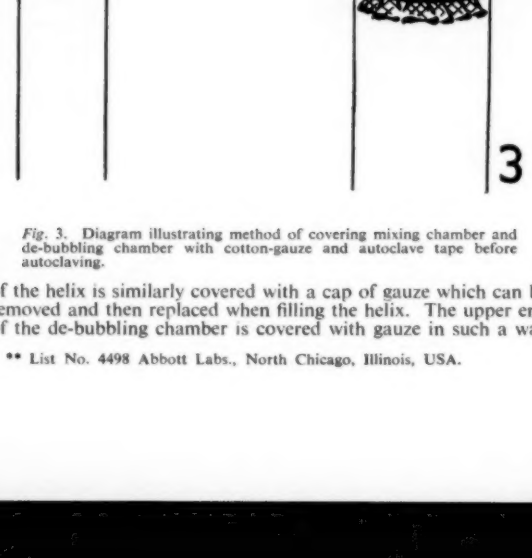

Fig. 3. Diagram illustrating method of covering mixing chamber and de-bubbling chamber with cotton-gauze and autoclave tape before autoclaving.

of the helix is similarly covered with a cap of gauze which can be removed and then replaced when filling the helix. The upper end of the de-bubbling chamber is covered with gauze in such a way that the hole into which the mixing chamber is inserted can be exposed without contamination and without uncovering the proximal end of the tube (Fig. 3). Elastic bands should not be placed around the Mayon tubing during autoclaving since this causes constriction of the tubing.

The technique of applying 'antifoam' is important to ensure adequate de-bubbling and to prevent 'bubbling over' from the proximal end of the de-bubbler and the top of the helix during perfusion. For each experiment 10 g. of 'antifoam' are used. Approximately ¾ of this is poured into the de-bubbling chamber before assembly and allowed to flow down its 'roof'. By means of a cotton-gauze plug on the end of a stout piece of wire this central stream is spread laterally so that the walls of the de-bubbler are evenly coated with a thin layer of 'antifoam'. There must be no pooling of 'antifoam' at any site. To increase the de-bubbling surface a 6-ft. length of ⅜ inch bore Mayon tubing is loosely coiled, coated with 'antifoam' and placed in the distal end of the de-bubbling chamber. The upper 20 inches of the helix, the *outer* wall of the tube leading from the de-bubbling chamber to the top of the helix, and the cardiotomy well are treated with the remaining 2½ g. of 'antifoam'—this is applied evenly to the walls of these portions of the apparatus by means of a gauze plug.

Each portion of the apparatus is then separately wrapped in a surgical towel and steam-autoclaved. It is essential for the operation of the oxygenator that the Mayon tubing be transparent. The tubing, however, tends to become 'fogged' during autoclaving and, in spite of experimenting with many different methods during the last 6 weeks, we have still not solved this problem to our entire satisfaction. This is due to the fact that a suitable autoclave is not available to us. Using the method to be described below, however, we are now able to produce transparent tubing after autoclaving, but the procedure is time-consuming and consequently we have not used a sterile technique in our experiments.

The tubing, wrapped in surgical towels, is placed in a steam autoclave at 259°F. and 20 lb. pressure per sq. inch for 30 minutes. The autoclave is then exhausted for 10 minutes at a negative pressure of −20 lb. per sq. inch. The door of the autoclave is then opened 12 inches and the tubing is allowed to cool down gradually during the ensuing 8 hours. The temperature of the autoclave we have used remains at about 150°F. during this time. The autoclave door is then opened to its full extent and the tubes are left for a further 8 hours.

The stainless-steel connectors and lengths of rubber latex tubes are boiled in a sterilizer immediately before assembling the oxygenator. The blood filters which we use are supplied sterile by the manufacturers.

Assembling the Oxygenator

The oxygenator (Fig. 2) is assembled in an ante-room by a surgeon under sterile conditions as for a surgical operation (in the laboratory, our apparatus is assembled by a technician). The various components of the venous circuit are connected as shown in Fig. 2. The ends of the tubes to the venous well (*a*), the blood-bottle filter (*b*) (or filters if 2 blood bottles are to be used simultaneously or alternately), and the mixing chamber (*c*), are covered with rubber finger stalls held in place by elastic bands. The cardiotomy circuit is then connected and joined to the venous limb (*d*), the end of the tubing from the cardiotomy well (*e*) being covered with a finger stall. The arterial circuit is then assembled, the connector (*f*) leading to the double metal filter is covered with a finger stall, and the connector (*g*), to which the arterial limb will later be attached, is covered with cotton gauze. As all the exposed ends are covered, sterile precautions are no longer necessary when handling this portion of the apparatus.

The apparatus, thus far assembled, is taken into the operating theatre for further assembly of the oxygenator. The arterial limb, leading to the patient, is kept sterile and, except for the proximal 12-inch end, which is handed to an assistant to be connected to the connector (*g*) (Fig. 2), is placed on a tray adjacent to the patient's right leg. The connections between rubber latex tubing, metal connectors, and Mayon tubing at the pump heads are tightly taped with adhesive strapping (Fig. 4). As an extra precaution, when used for operations on patients, radiator hose clamps are applied over the strapping to secure the rubber latex tubes to the stainless-steel connectors. To prevent the rubber tubing from 'milking through' the pump, several layers of adhesive tape are

** List No. 4498 Abbott Labs., North Chicago, Illinois, USA.

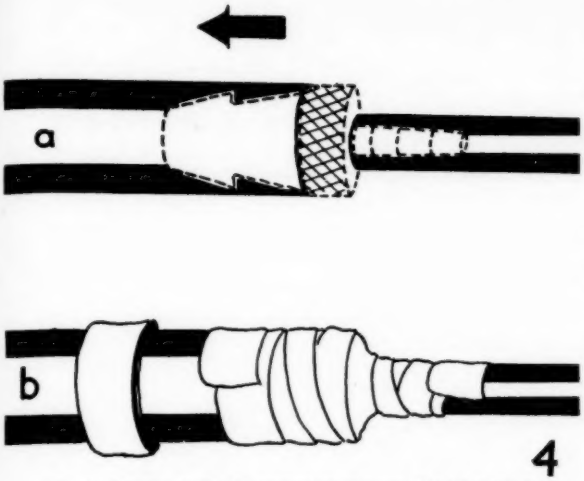

Fig. 4. Diagram illustrating connections at pump head (*a*) before and (*b*) after securing with adhesive tape. The 'shoulder' of adhesive tape is also shown, the arrow indicating the direction of flow.

wound around the tubing forming a shoulder on the inlet side of the pump head (Fig. 4).

The mixing and de-bubbling chambers are then set up on a metal stand (Fig. 1). The venous circuit is connected to the mixing chamber and the venous well, which have been previously secured in position by means of metal brackets. Rubber finger-stalls or cotton gauze coverings are removed and the Mayon tubing is slipped over the metal connectors, care being taken to avoid contamination of the ends during this process. The cardiotomy limb is similarly connected to the bottom of the cardiotomy well. The leads from the cardiotomy sucker to the cardiotomy well and from the venous catheters to the venous well are handled by the operating surgeon and connected during the course of the operation.

The connection between mixing and de-bubbling chambers is made under sterile conditions. This is done by removing the gauze covering the end of these chambers and inserting the top of the mixing chamber into the hole in the de-bubbler without contaminating these parts.

Priming the Oxygenator with Dextrose-Water Solution

The sterile helix, both ends of which are covered with gauze, is wound onto an aluminium stand in such a manner that its lower and upper 12 inches form a steep slope; the central coils of the helix slope only slightly downwards (Fig. 1). The double metal filter is then joined to the connector at the bottom of the helix and the limb distal to the filter is clamped.

The helix is then partially filled with sterile 5% dextrose-water solution. The next step is to clear approximately 500 ml. of fluid in the lower end of the helix of bubbles. This is done by trapping a large bubble at the distal end of the helix, which is then slowly allowed to ascend. As it ascends smaller bubbles coalesce and pass upwards in the helix, which is finally beaten with a patellar hammer to dislodge all bubbles. This is an essential operation in the setting up of the oxygenator—every bubble must be dislodged and this may take 20 or 30 minutes to achieve.

Once all the bubbles have been dislodged from the helix the filter must be similarly filled and cleared of bubbles. This is achieved by loosening the clamp on the arterial limb thus allowing fluid to pass slowly from the helix into the filter. The latter is then beaten with the patellar hammer to dislodge any bubbles which may have been trapped. The tubing distal to the filter is clamped and connected to the arterial circuit (*f*) which has previously been assembled. The clamp is then removed and the fluid is allowed to flow slowly through the remainder of the arterial limb, the distal end of which will be connected to the femoral artery catheter, and is handled under the sterile precautions already described. The possibility of bubbles being trapped in the opaque section of latex rubber tubing passing through the pump head must be remembered—this section is therefore also beaten to obviate this possibility. When all bubbles have been dislodged, the end of the arterial limb is clamped with a sterile clamp and the helix, on its stand, is placed in the water bath. At no stage should the volume of fluid in the helix be allowed to fall below 500 ml. thus preventing the possibility of bubbles entering the arterial circuit. The rubber latex tubing of the arterial circuit is then placed in the pump and the latter is checked for occlusion, and calibrated.

Pump Occlusion and Calibration

The sigmamotor pump is used as an occlusive pump, i.e. one finger of the pump mechanism is always compressing the tubing, thus preventing back-flow. Should the pump be incorrectly set and non-occlusive, raising the resistance against which it has to pump will decrease the output.[8]

The arterial limb of the circuit distal to the pump (still handled under sterile precautions) is elevated above the level of fluid in the helix and all clamps removed. If the pump is correctly set there should be no back-flow into the helix. The pump is rapidly turned on and off by an assistant so that a different finger of the pump comes to lie in the closed position and occlusion is again checked. This manoeuvre should be repeated 5 times. Should there by any back-flow the occlusion plates on the pump are adjusted until this no longer occurs. It is important to adjust the plates in such a manner that occlusion is not excessive thus preventing excessive haemolysis of the blood.

The pump is calibrated using arterial catheters of a size estimated to be suitable for the patient undergoing perfusion. This catheter is connected to the end of the arterial limb, the pump is turned on for 15 seconds and the volume of fluid pumped is measured. The volume flow per minute for a given size catheter at a given pump-speed-setting is then calculated. During the operation, the pump operator is therefore able to achieve a known arterial input by setting the pump speed accordingly. Once again during this procedure 5% dextrose in water is added to maintain the volume of fluid in the helix.

Priming the Oxygenator with Blood

The oxygenator is primed with compatible donor blood to which heparin (20 mg./500 ml.) has been added as an anticoagulant. The blood should be at a slightly higher temperature than the water in the waterbath surrounding the helix. If cold blood enters the helix, dissolved oxygen will come out of solution as the blood is warmed and minute bubbles will be formed. In animal experiments we have not performed compatibility tests. In operations on humans, each pint of blood is cross-matched with the patient's blood, and with every other pint.

A volume of blood equal to the calculated minute-flow for the patient is required to prime the oxygenator and priming is commenced about 20 minutes before the surgeon is due to insert the catheter into the femoral artery. When the catheter has been inserted, the priming of the oxygenator should have been completed, so that the arterial limb may immediately be connected to the femoral catheter. The vena caval catheters are inserted after this connection has been established; should they obstruct the venous return to the heart the perfusion can then be commenced with a minimum of delay.

The arterial head of the pump is opened and the helix is drained until approximately 100 ml. of 5% dextrose-water remains. The venous circuit is then placed in the pump, the arterial head is left open, the lead from the venous well is clamped, the oxygen flow is turned on (a slow flow rate of 2 litres per min. is adequate during priming), the blood is connected and the venous pump is started. Blood is thus pumped *via* the mixing chamber and de-bubbler into the helix. Once the oxygenator has been primed the oxygen flow must not be turned off completely, or the minute holes in the oxygen diffuser will become blocked.

During priming, the clamp on the lead from the venous well is temporarily released to allow blood to enter the well and to rise to a depth of about 8 cm. This provides blood to be pumped *via* the mixing chamber, until the venous flow from the venae cavae to the venous well becomes established.

The helix, which is now in the waterbath, is examined and any bubbles in the blood column are dispersed as previously described. When all bubbles have been dislodged, the clamp is removed from the end of the arterial limb by the surgeon and the 5% dextrose-water is run out to be replaced by blood. The arterial

head of the pump is closed, the level of blood in the helix is noted and marked on the outside of the perspex waterbath, and the oxygenator is then ready to be connected to the patient.

OPERATIVE TECHNIQUE

1. *Bleeding of Donors*

Dogs are anaesthetized with a volatile anaesthetic agent (or N_2O and O_2), an endotracheal tube is inserted, and intermittent-positive-pressure respiration is instituted. A femoral cut-down, with a local anaesthetic, is performed and a catheter is inserted into the femoral artery. The blood is run into glass bottles, which are gently agitated and to which heparin has been previously added. The donor blood is placed in a waterbath at 41° C, where it is kept until the oxygenator is primed.

Barbiturates should not be used to anaesthetize donor dogs; this has been shown to lower the survival rate of the dogs used for the experiments (DeWall *et al.*,[4] Milner *et al.*[5]).

Human donors are bled on the morning of the operation. Venous blood is drawn into sterile siliconized glass bottles to which heparin has been added.

2. *Anaesthesia*

The staff of the anaesthetics department, Groote Schuur Hospital, have kindly administered anaesthetics for all our experiments, and the salient points, without details of methods used are as follows:

Anaesthesia, in 13 dogs, consisted of thiopentone induction followed by N_2O with O_2 for maintenance. In 4 dogs, thiopentone induction followed by intermittent doses of thiopentone was used. In the remaining 3 animals, a technique using only volatile anaesthetic agents was employed and will be the subject of a further communication.

It appears to be important to maintain a very light plane of anaesthesia throughout. At the onset of perfusion one is faced with the problem of 2 volumes of blood, viz. (1) that in the patient's circulation and (2) that in the oxygenator, each of which may contain a different concentration of anaesthetic agents and relaxants. In practice we have found that post-operative recovery has been more rapid if no additional barbiturate or relaxant is administered during bypass. This cannot always be achieved and considerable skill and practice is necessary in clinically judging the correct state of anaesthesia before the start of perfusion, since signs of depth of anaesthesia are difficult to assess once perfusion has commenced. EEG monitoring of anaesthesia would, we feel, enable more constant conditions to be achieved. Facilities for this are unfortunately not yet available to us. Details of anaesthetic problems will be the subject of a separate communication.

3. *Cannulation*

A thoracotomy is performed through the right 4th interspace. Particular care is taken with haemostasis, all bleeding points being coagulated with diathermy. The azygos vein is ligated in continuity at its point of entrance into the superior vena cava. A tape is placed around each vena cava at its entrance into the right atrium and the two ends of each tape are drawn through 2-inch cuffs of rubber tubing. By tightening and cross-clamping these (Fig. 6*a*) once the cavae have been catheterized, the entire systemic venous return can be shunted into the venous well. The pericardial sac is then opened, and the edges of this incision are cauterized.

The left femoral artery is then exposed, the patient is heparinized (1·5 mg per kg. body weight), and the largest possible Bardic* arterial catheter is introduced through a transverse arteriotomy. In the dog the distal end of the artery is ligated to prevent bleeding back. In the patient the artery is clamped and the defect is repaired when the catheter is removed after the perfusion. The technique of anchoring the catheter firmly is shown in Fig. 5. The arterial catheter is connected to the arterial limb of the oxygenator in such a manner that no bubbles are trapped at the connection. In order to achieve this, the blood in the arterial limb must completely fill the tubing so that a meniscus bulges from the open end of the tubing. The arterial catheter is then gradually released and the connection is made as blood begins to flow from this catheter. The connection is then firmly tied with linen thread to prevent the possibility of slipping.

* Bardic No. 1055. Manufactured by C. R. Bard Inc. USA.

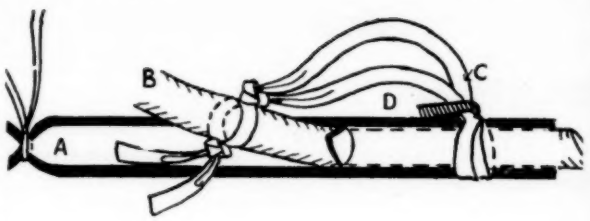

Fig. 5. Diagram illustrating method of anchoring arterial catheter *in situ*. A = Artery. B = Catheter. C = Umbilical tape. D = Artery forceps.

Large-sized Bardic catheters are used for cannulation of the venae cavae and are inserted *via* the right atrium. The distance from the point of insertion of each catheter into the auricle to each vena cava is estimated. A ring $\frac{1}{8}$ inch in width is cut from a section of rubber tubing and slipped over each catheter to mark this point. A purse-string suture of atraumatic 'O' silk is placed around the apex of the right auricular appendage and the two ends of the suture are threaded through a short cuff of $\frac{1}{4}$-inch-bore

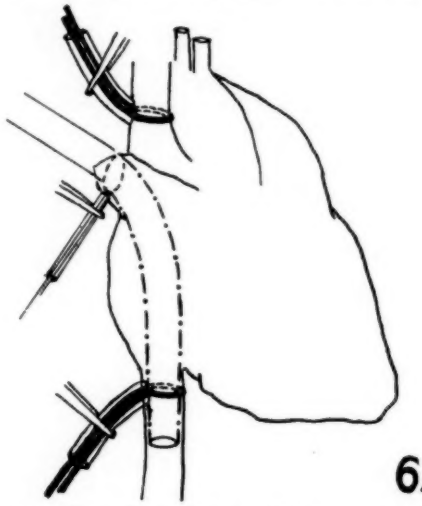

Fig. 6 (*a*). Diagrammatic representation of inferior vena caval catheter *in situ*, showing method of taping and occluding venae cavae and of anchoring catheter in the atrium.

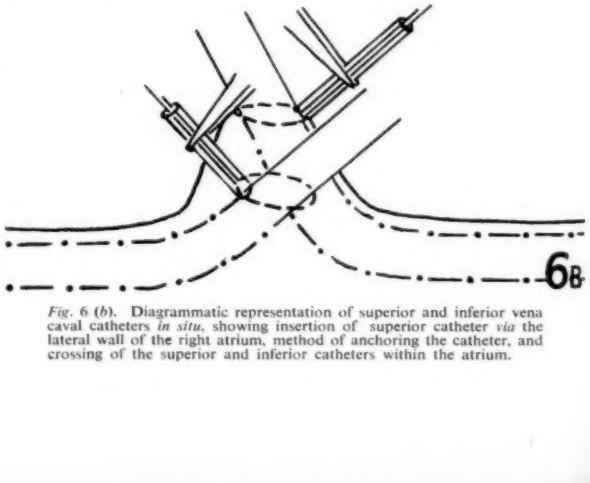

Fig. 6 (*b*). Diagrammatic representation of superior and inferior vena caval catheters *in situ*, showing insertion of superior catheter *via* the lateral wall of the right atrium, method of anchoring the catheter, and crossing of the superior and inferior catheters within the atrium.

rubber tubing. An auricular clamp is then applied below the purse-string, the apex of the auricular appendage is snipped off and any obstructing musculi pectinati are cut through. As the clamp is released, the inferior vena caval catheter is inserted until the rubber marker is flush with the purse-string, which is pulled tight and anchored by cross clamping the rubber cuff (Fig. 6*a*). A second purse-string is then inserted in the right lateral well of the right auricle (Fig. 6*b*). Traction on the two ends of the suture causes the auricular wall to 'peak' and a clamp is applied below the purse-string. A longitudinal incision is made in the auricular wall in the centre of the purse-string suture and, as the clamp is withdrawn, the superior vena caval catheter is inserted and anchored as before. The two catheters are then connected to the venous well and the perfusion can now be commenced.

4. *Perfusion*

The pump is turned on to start the bypass, the arterial flow being set at a predetermined level, calculated according to body weight. The tapes around the venae cavae are tightened, so that the total venous return leaves the body *via* the venous catheters. The only blood entering the heart at this stage is the coronary venous return. Intermittent-positive-pressure respiration is then stopped, the lungs being kept in a semi-inflated position during the perfusion. At the commencement of the perfusion, the level of blood in the helix will fall. As soon as the mixing and de-bubbling chambers become filled, the helix level will remain stable, provided that the venous return is unimpeded and that there is no blood loss from the cardiotomy. The venous pump is so regulated that there is always some blood in the venous well. This prevents air from being sucked in, which would cause unnecessary turbulence and haemolysis. The level of blood in the helix must be carefully observed and not allowed to fall below the 500 ml. mark. Should this occur a known volume of blood is allowed to enter the oxygenator by releasing the clamp (*h* in Fig. 2) on the tube from the blood bottle to the venous circuit. The cardiotomy well is intermittently emptied by turning on the cardiotomy pump. If for any reason it is desired to increase the perfusion rate, the arterial head of the pump can be adjusted accordingly.[10]

5. *Termination of Perfusion*

When it is desired to stop the perfusion, the tape around the superior vena cava is released and intermittent-positive-pressure respiration is recommenced. Some venous blood now enters the heart, which gradually begins to take over the circulation. If the beat remains steady the inferior vena caval tape is released, and after a few minutes the pump is turned off and the arterial and venous limbs of the circuit are clamped.

The venous catheters are removed one at a time, the defects in the auricle being closed by tying the purse-string sutures which are already *in situ*. One half of the calculated dose of protamine sulphate is then injected intravenously, the remaining half being administered slowly during the next half hour. The total dose of protamine sulphate which we have used is equal to twice the amount of heparin originally injected.[7, 11, 12] The arterial catheter is then removed and the proximal end of the artery ligated.

A rubber drain connected to a suction apparatus at a negative pressure of −30 mm. Hg. is placed in the pleural cavity and the thorax is closed in layers with continuous linen sutures. The drain is removed when blood loss from the thorax ceases (usually about 30 min. post-operatively) and the animal is placed in a warmed cage. No special post-operative care, other than anti-biotic therapy, has been found necessary.

RESULTS

The results of our first 20 consecutive operations on mongrel dogs are shown in Table I. The animals were perfused at a flow rate of 70 ml. per kg. of body weight per minute and

TABLE I. RESULTS OF OPERATIONS ON 20 MONGREL DOGS—PERFUSED AT A FLOW RATE OF 70 ML. PER KG. OF BODY WEIGHT PER MIN.

Dog No.	*Wt. (kg.)*	*Duration of bypass (min.)*	*Operative procedure*	*Anaesthetic*	*Art. O_2 / Ven. O_2 vols. %*	*Art. CO_2 / Ven. CO_2 vols. %*	*Result*
1	16	15	*nil*	Pent. O_2	—	—	Survival
2	13	26	*nil*	Pent. O_2	—	—	Survival
3	19	32	*nil*	Pent. N_2O O_2	—	—	Survival
4	16	30	*nil*	Pent. O_2	91 71	20·6 20·8	Survival
5	14	30	*nil*	Pent. N_2O O_2	101 57	35 43·5	Survival
6	13	35	*nil*	Pent. O_2	99 69	32 36	Survival
7	16	30	RV	Pent. N_2O O_2	95 75	Spoilt	Survival
8	14	32	RV	Pent. N_2O O_2	—	—	Survival
9	14	31	RV	Pent. N_2O O_2	—	—	Survival
10	13	30	RV	Pent. N_2O O_2	98 76	36 43·5	Survival
11	17	35	RV	Pent. N_2O O_2	96 61	36·5 49	Survival
12	16	32	X	Pent. N_2O O_2	—	—	Died 3 hours post-op.
13	13	28	RV	Pent. N_2O O_2	—	—	Survival
14	13	22	*nil*	Pent. N_2O O_2	—	—	Survival
15	14	22	RV	Pent. N_2O O_2	—	—	Survival
16	14	54	Y	Volatile anaesthetic agents	100 73	26 30·5	Survival
17	18	52	RV	,,	—	—	Survival
18	14	23	RA	,,	—	—	Survival
19	15	68	Z	Pent. N_2O O_2	—	—	Survival
20	14	45	RV	Pent. N_2O O_2	—	—	Died 21 hrs. post-op.

RV = Right ventriculotomy. RA = Right atriotomy.
X (dog no. 12) = Induced cardiac arrest (7 min.) with 3 c.c. of pot. cit., cardiac massage to re-start and intravenous 1/1000 adrenaline given.
Y (dog no. 16) = Right ventriculotomy and induced cardiac arrest with pot. cit. Fibrillation for 17 min. Electrical defibrillation.
Z (dog no. 19) = Right atriotomy + ventricular fibrillation for 5 min. Electrical defibrillation.

the aim of each experiment was the survival of the animal. We did not employ a sterile technique and animals were given penicillin and streptomycin post-operatively.

EEG tracings and pressure studies were not performed. Post-perfusion arterial and venous O_2 and CO_2 content were not estimated as a routine. Such biochemical results as are available have been included in Table I.

We have experienced no difficulty with post-operative bleeding, the average post-operative blood loss from the chest being less than 50 ml.

All our survivors were able to stand (and usually walk) and eat within 18 hours after the operation. All animals survived for a minimum of 7 days; they were then destroyed or used as donors for further experiments. None of the survivors showed any clinical evidence of cerebral damage.

There were only 2 deaths in this series. The first death (dog 11) followed elective cardiac arrest of 7 minutes' duration, with the Melrose technique.[13] Cardiac massage and intravenous injection of 1/1,000 adrenaline was necessary before the heart commenced to beat. The pulse at the termination of the operation was satisfactory but the animal died 3 hours later. No cardiotomy was performed, and so the injected potassium citrate was not removed from the circulation; we believe that this omission was responsible for the animal's death.

The only other death (dog 20) was almost certainly the result of using unsatisfactory donor blood. The experiment was uneventful and the dog's pulse was satisfactory after the operation. However, the animal took several hours to recover from the anaesthetic (this is unusual, for most of our dogs have been awake within 1 hour of the completion of the operation), would not stand or eat the following morning, and died 21 hours after the operation.

DISCUSSION

In a recent paper read before the Society of University Surgeons, Columbus, Ohio, Diesh *et al.*[3] observed that in spite of numerous publications on the subject of extra-corporeal circulation, there is a dearth of information concerning survival of experimental animals. We have experienced similar difficulty in ascertaining results of other experimental workers for comparison with our own. Also, the fact that many different groups of workers continue to test one oxygenator after another, before applying cardiac bypass clinically, suggests that a significant mortality in experimental animals may be a general phenomenon.

Using a modified DeWall-type bubble oxygenator Diesh *et al.* had no survivors in 14 dogs perfused for 20 minutes at 70 ml. per kg. of body weight per minute and only 10 survivors in 29 dogs perfused for 20 minutes at 35 ml. per kg. per minute. Using dual oxygenators in parallel, they had only 3 survivors in 10 dogs perfused for 20 minutes at 70 ml. per kg. per minute. In a discussion on the above paper Dennis[4] infers that his results, using the bubble oxygenator, were unsatisfactory and Clowes[5] quotes a 50% mortality rate (number of experiments not stated).

King *et al.*,[14] using a further modification of the DeWall-type oxygenator, had only 1 survivor in 5 perfusions of a duration of 1 hour at a flow rate of 40 ml. per kg. per minute (this animal was spastic after the perfusion) and 1 normal survivor in 6 perfusions at a flow rate of 70 ml. per kg. per minute.

Using an unmodified DeWall-type oxygenator, Abrams *et al.*[15] perfused 42 dogs for periods of 10-76 minutes with 26 survivors. In 22 of their experiments potassium-citrate arrest was induced with 14 survivors. In 16 simple perfusions of 10-45 minutes' duration, with no additional operative procedure, there were 8 survivors.

In the light of the above reports our experimental results would appear to be satisfactory, especially as this work has been in progress for only 6 weeks. There is still, however, room for improvement and, in the words of Sir James Leamonth,[16] 'We cannot aspire to *best*; we can constantly strive for *better*.' The ideal of 100% survival after perfusions of longer duration is still to be attained.

CONCLUSIONS

We believe that the helix reservoir bubble oxygenator is a highly satisfactory oxygenator for open-heart surgery, and that its satisfactory operation is dependent on team-work and attention to a multitude of details, the omission of any one of which may lead to disaster. The death of a patient due to an avoidable error in perfusion technique is a tragedy which can be obviated only by repeated experimentation, and the familiarity of all concerned with the apparatus used.

In the description of our technique we have stressed those details which we consider to be of importance and have attempted to point out where errors are likely to occur. Provided that the oxygenator is correctly used, bubble traps and other modifications would appear to be unnecessary and may even be harmful.[6]

SUMMARY

The preparation and assembly of the helix-reservoir bubble oxygenator is described in detail, with particular reference to certain points which we consider to be essential for its proper function.

The technique of bleeding donor animals, anaesthesia, cannulation and perfusion is described.

The results of our first 20 consecutive dog experiments, using the oxygenator, are reported and discussed. There were only 2 deaths in this series.

It is concluded that the satisfactory operation of the oxygenator depends on team-work and meticulous attention to many details. Provided that it is correctly used, the helix-reservoir bubble oxygenator is a highly satisfactory apparatus for use in open-heart surgery.

We are grateful to Prof. J. H. Louw, Professor of Surgery, University of Cape Town, for his constant advice, encouragement and assistance in setting up our laboratory, to the staff of the Anaesthetics Department, Groote Schuur Hospital, who have anaesthetized all our experimental animals, and to Mr. Carl Goosen for his technical assistance. Messrs. L. W. Pillar and P. Flagg kindly performed the biochemical estimations.

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CLINICAL PATTERNS IN INTESTINAL STRANGULATION

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Although it is a fact that during the last decade fatality rates of only single figures have been published for certain forms of acute intestinal obstruction, the full mortality rate is still in the region of 10-15%, while that of established strangulation has been varyingly reported in the region of 20% or more.[2-7, 9, 11, 13, 14] In this country Kok,[8] in his recent report on deaths occurring during or shortly after anaesthesia, comments on the incidence of such cases operated on for acute bowel obstructions.

My observations are based on a series of 114 strangulating bowel occlusions, of which 78% showed some degree of vascular insufficiency while 26% were gangrenous. The mortality rate was 15% while that for intra-abdominal strangulation was 20%. In 10 cases operation was not undertaken.

The time element is important. The fatality rate was *nil* for patients dealt with during the first 24 hours and low for cases operated on during the first 48 hours, but thereafter the mortality rose steeply and was 50% and more for cases operated on the fourth day or later. Although the greatest incidence of gangrene was noted amongst the fourth-day group, 8·6% of cases seen during the first 24 hours had infarcted loops, while 22% of the first 48-hour group were affected in a similar way.

Although it has been stated that shock in strangulation is seldom if ever irreversible, if adequate supportive measures are instituted, it is my impression that a 'point of no return' has frequently been reached by the time some of these cases are seen by a surgeon. The recognition of such lesions at as early a stage as possible becomes then a matter of some importance.

CLASSIFICATION AND CLINICAL FEATURES

I have classified my cases, irrespective of the aetiological factors, into the following groups:

1. *Internal loops*, where the affected loop lies in a free peritoneal cavity.

2. *Excluded loops*, where the affected loop, while being intra-abdominal, is excluded from the general peritoneal cavity, as in most cases of intussusception or where a strangulated loop is sealed off by omentum.

3. *External loops*, where the loop is extra-abdominal, as in external herniae.

Table I shows the justification for this classification in terms of the prognosis and major clinical features. There were no diagnostic errors regarding the external group, and very few of the excluded group (intussusceptions) gave rise to difficulty in diagnosis.[7] Amongst the internal group, however, such errors were common and at times led to delay in treatment or to inadequate or precipitate treatment. More than 40% of patients who presented at operation with gangrenous loops had been incorrectly diagnosed in the first instance. Thus, in relation to the clinical patterns, my remarks are more or less confined to cases with internal loops; 52 such cases are reviewed here.

TABLE I. PROGNOSIS IN TERMS OF PERITONEAL RELATIONSHIPS

	Internal	*Excluded*	*External*
Mortality	28%	12%	5%
Vascular insufficiency	86%	82%	69%
Gangrene	45%	6%	13%
Shock	35%	11%	9%

The signs and symptoms of intestinal strangulation fall into 3 groups, viz. (1) those related to the degree of luminal occlusion, (2) those pertaining to the degree of vascular insufficiency and (3) those resulting from a closed loop, which is a feature of most cases.

LUMINAL OCCLUSION

The classical signs and symptoms of cases in this group are colic, vomiting, distension and constipation (Table II).

TABLE II. SIGNS AND SYMPTOMS IN RELATION TO LUMINAL OCCLUSION

	Internal		*Excluded*	*External*
	Viable	*Gangrenous*		
Colic	71%	35%	80%	60%
Vomiting	71%	61%	80%	30%
Distension	57%	44%	30%	30%
Constipation ..	54%	35%	40%	40%

1. *Colic*

While it may be true to say that colic is a feature of most cases of intestinal occlusion, the recognition of this symptom is a somewhat different matter. Typical colic, while being a marked feature of intussusception, where it was noted in 80% of cases, was observed or recorded in the history of only 7·1% of cases, presenting with internal loops, and in only 3·5% of cases with gangrenous loops.

This fact contributed towards diagnostic error, and reasons for this are as follows:

(*a*) Once luminal occlusion is fully established, irreversible colic passes off and ileus supervenes. Most of my cases showed some degree of torsion, and under such conditions complete luminal occlusion may eventuate within a relatively brief period. Moreover, the internal group tended to present much later than the others, thus allowing time for luminal occlusion to become complete. Consequently, by the time many of these patients were seen, colic was no longer a feature. Amongst the intussusceptions, on the other hand, the lesion tends to be progressive during the first 48 hours and the apex of the inverted loop often acts as a foreign body; typical colic thus becomes a more apparent feature.

(*b*) The fact that colic was noted in only 35% of cases

with internal loops which were gangrenous, does not imply that colic was at no time present in the other cases. Often enough in such cases the more acute, generalized and unremitting pain of a strangulation so dominates the patient's mind that his earlier crampy pain is overlooked. At the same time, where such patients presented as acute emergencies, it is apparent that those who first saw them accepted the obvious picture of an abdominal crisis requiring laparotomy without delving sufficiently deeply into the patient's history in every case.

(*c*) Where the upper level of occlusion is high in the small intestine, colic may not be a feature of an occlusive lesion.

(*d*) Colic is not necessarily a mid-line pain.[10]

2. *Vomiting*

Much attention has been paid to vomiting as a symptom, and there is a tendency to expect repeated vomiting, which is often a late feature of acute bowel occlusion.

In 80% of the inversions, and in 60-70% of cases with internal loops, vomiting occurred. It was, however, an initial symptom only in the majority, repeated vomiting being seen mainly in late cases. Constant retching, which has been described as characteristic in cases of established strangulation, was uncommon. Blood in the vomitus, or an actual haematemesis, was noted in a few instances where an infarcted loop presented.

Far more important than vomiting is anorexia and nausea. A high degree of gastric retention may be present without any vomiting. It is my practice to pass a gastric tube and estimate the degree of retention as a diagnostic measure. One has frequently heard housemen say to a patient: 'Have you been vomiting?' and the patient, who may have vomited once and who suffers from intense nausea, promptly says: 'No'.

The absence of vomiting at times is hard to explain. One of my cases was an adult female who had a triple torsion of the midgut and who was seen only on the third day of her illness. She had vomited only once, did not admit to colic at any time, was not distended, and said that she had passed flatus after the onset of her abdominal pain. She presented with acute pain, shock, peritoneal irritation and signs of internal bleeding. A gynaecologist operated on her for a bleeding tubal pregnancy—only to find himself confronted with 18 feet of infarcted gut.

3. *Distension*

Although Aird[1] and Wangensteen[15] have stressed the inconstant relationship between strangulation and distension, there is a tendency to expect gross and obvious distension where an occlusive process is concerned. Distension was not a prominent feature in my cases except where colonic closed loops and late cases were concerned. At the same time a localized loop distension may be more real than apparent and should be carefully looked for by rectal, vaginal, and bimanual examination. Only 30% of inversions showed abdominal distension and these were on the whole late cases. Of the cases with internal loops only 50% presented with distension as a feature and only 44% of cases with gangrenous loops showed this sign.

Most strangulating loops are of medium length and are easily accommodated in the pelvis without visible distension of the abdominal wall, while in cases of infarction the blood-sodden loop is incapable of becoming distended to any degree.

4. *Constipation*

Constipation is the least reliable feature of an occlusive lesion. A motion and flatus may be passed subsequent to the onset of a strangulating lesion and within a few hours of infarction. Again, the presence or absence of absolute constipation has frequently been accepted or rejected on subjective grounds alone, and the presence of such a symptom may be more real than apparent. In less than 50% of cases of inversion and of gut torsion in this series, was constipation a prominent symptom.

I seldom use the 2-enema test because it is disturbing to the patient, and because staff simply will not remain at the bedside to determine exactly what happens after the administration of an enema, and lastly because X-ray examination probably provides more adequate information.

The real or apparent absence of the classical evidence of an acute bowel occlusion was a not uncommon source of misdiagnosis by those who first saw my cases. Where loops were viable 2 of the 4 classical signs were present in 70% of cases and the remaining 2 in over 50%. But where loops were non-viable only 1 of the classical signs was present in over 50% of cases and the others presented in less than half of the patients, or were only detected to this extent.

Case 1

A middle-aged woman presented with gastro-intestinal bleeding and abdominal pain but no vomiting and no distension, and she was apparently not constipated since faecal matter was at first mixed with the blood passed *per rectum*. Despite the fact that she complained of typical colic she was treated as a case of gastro-duodenal bleeding in a medical ward until the third day. At this stage an X-ray examination revealed a single small-bowel fluid level. At operation she had a non-viable small-bowel intussusception due to a polyp.

Case 2

A middle-aged man developed abdominal pain but no history of colic was obtained. Distension and vomiting became apparent only on the third day. Although he had absolute constipation from the start, the fact that he frequently went to the lavatory, in response to a rectal tenemus, was assumed to indicate the passage of motions. His doctors became alarmed only on the third evening, when signs of peritonitis became apparent. At operation he was found to have a gangrenous and perforated ileo-caecal volvulus.

VASCULAR INSUFFICIENCY

The signs and symptoms of vascular insufficiency are essentially: Shock, tachycardia, peritoneal irritation, pain, evidence of blood loss, and a tumour.

1. *Shock*

Much stress has been laid on shock as a clinical sign of strangulation. In this series shock was a prominent feature in cases with long loops (many of which were gangrenous) but was noted in only 14% of cases with medium loops and in only 11% of cases with short loops. Again, shock was prominent in internal-loop strangulation. It was not a clinical feature of inverted or external non-viable loops.

Where loops were of medium length and viable, shock was only present if sufficient time had lapsed to allow of severe distension of the proximal gut. Thus shock as a clinical sign is of little assistance in diagnosing the medium-length strangulating, but not yet infarcted, loop. Also, shock may not be apparent in cases of medium-loop infarction, but here

it should be stressed that shock as a pathological state, as distinct from a clinical symptom, may be far more real than apparent. Patients may present with none of the usual bedside criteria of shock and yet have a seriously reduced blood volume.

Two cases operated on by me, illustrate this observation. Both were African females whom I saw on the fourth day of illness after being originally diagnosed as a case of amoebic liver abscess and a case of tubo-ovarian abscess. In neither was a history of colic obtained, neither had vomited more than twice, neither was distended and neither had admitted to constipation. Both presented with evidence of peritoneal irritation and an abdominal tumour. Both had systolic blood pressures of over 110 mm. Hg and pulse rates of under 100. Neither appeared to be in the least shocked. Both, however, were given a pint of blood pre-operatively. At operation each presented with a medium-loop gangrene, there was no distension to any degree of proximal gut, neither loop had ruptured, but both cases had a pint or so of bloody exudation in the peritoneal cavity. After operations lasting little more than half an hour, both passed into a state of acute and irreversible peripheral vascular failure.

These patients were either given inadequate transfusions before surgery or they had already reached a 'point of no return'.

2. *Tachycardia*

A rapid pulse may be expected but is again not the rule even in the face of medium-loop gangrene. What is important, however, is a sudden and abrupt rise in the pulse rates of patients who are being treated conservatively for simple occlusion.

3. *Peritoneal Irritation*

Much stress[15] has been laid on evidence of peritoneal irritation in diagnosing the strangulated as distinct from the simple occlusion. While it is a fact (Table III) that such

TABLE III. LOCAL SIGNS OF STRANGULATION

	Internal		*Excluded*	*External*
	Viable	*Gangrenous*		
Peritoneal irritation	64%	83%	30%	15%
Tacycardia	46%	78%	80%	50%
Tumour	29%	35%	80%	100%

signs as rebound pain, abdominal-wall tenderness, guarding or rigidity were prominent where a loop had become gangrenous (in over 80%), the crux of the problem is to diagnose the strangulating, but not yet fully strangulated loop.

In this series evidence of some degree of peritoneal irritation was noted in over 60% of cases. This is a point of some importance. It must be noted, however, that amongst cases with gangrenous loops such evidence was usually, although not always, prominent; amongst the viable group, on the other hand, such evidence had to be carefully looked for.

4. *Pain*

Abdominal pain, usually acute and unremitting, often generalized but frequently quadrantal, was the least variable and sometimes the only clinical sign. Space does not permit a full discussion of the causes of abdominal pain, but its importance must be stressed. It was commonly acute, but where a replacement gangrene occurred, and in patients already seriously ill from some concomitant disorder, pain was at times misleadingly mild. Patients treated conservatively for simple occlusions should only be mildly sedated if at all. The following case illustrates the role of pain in this regard.

An adult male presented with the classical signs of simple bowel occlusion. This was confirmed on X-ray examination (Fig. 1) which showed a fluid level. The nature of this level, together with an inverted U loop, should have suggested a closed-loop obstruction. No comment, however, was made on this. After a period of gastro-intestinal suction the patient's symptoms

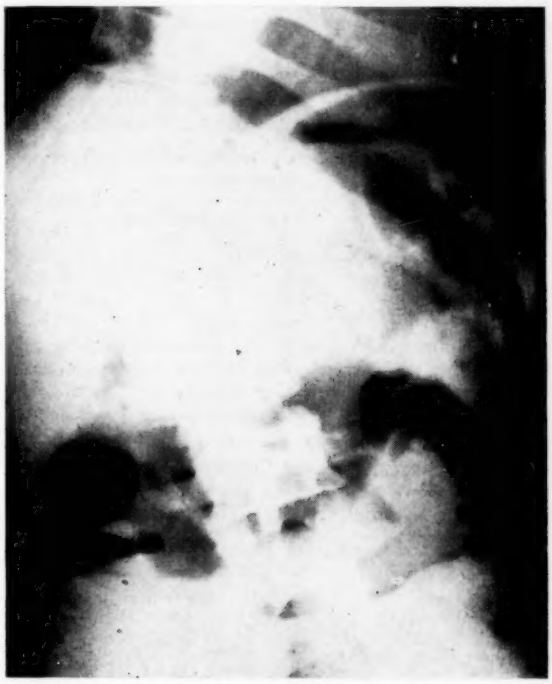

Fig. 1. A fluid level in a closed-loop occlusion.

settled down, distension was relieved, normal bowel sounds were heard and flatus was passed. A repeat X-ray examination at this stage showed no evidence of bowel occlusion, but the patient, who had been sedated previously, began to complain of a continuous pain in the R.I.F. He said that this pain was present from the beginning, but was now acute. At operation a plum-coloured loop presented as part of a small-bowel (adhesive) volvulus. Had he not been sedated return of the pain while on gastro-duodenal suction would have been apparent at an earlier stage.

5. *Evidence of Blood Loss*

Evidence of whole-blood loss were only of clinical significance where long-loop strangulations were fully established.

6. *Tumour*

A palpable tumour mass was noted in over 70% of cases with the inversions but was less often a feature of cases with free-lying internal loops; yet in 35% of cases with gangrenous loops and in 29% of cases with viable loops a mass was detected.

The presence of a mass in a patient who shows any evidence whatsoever of an occlusive process, is strongly indicative of strangulation.

The need for careful rectal and bimanual examination should be stressed once more.

CLOSED LOOP

The signs and symptoms related to a closed loop were as follows: (1) Failure to secure adequate relief of pain after a trial period of gastro-intestinal suction. (2) A disproportionate distension or a localized loop distension or a palpable tumour. (3) X-ray evidence of a closed loop or isolated loop or disproportionate loop distension.

1. *Trial Suction*

Table IV shows my results in a series of 30 cases where simple and strangulating lesions presented at a stage where a trial period of suction was indicated. Adequate suction

TABLE IV. RESPONSE TO GASTRO-DUODENAL SUCTION

	Simple Occlusions		*Closed Loops*
	High	*Middle and Low*	
Complete relief of pain	100%	44%	*Nil*
Incomplete relief of pain	*Nil*	44%	33%
No relief	*Nil*	11%	67%
Return of original pain	*Nil*	11%	80%

no doubt implies the passage of a long tube into the small bowel. This is, however, often both time-consuming and difficult and even a gastric tube is sometimes useful in this connection. Table IV also shows that suction is of diagnostic importance.

2 *and* 3. *Other Signs of Loop Distension*

Table V shows the extent to which other signs of closed-loop obstruction were present. It must, however, be stressed

TABLE V. SIGNS RELATING TO CLOSED LOOPS (INTERNAL LOOPS ONLY)

	All Loops	*Gangrenous Loops*	*Viable Loops*
Tumour	31%	35%	29%
Disproportionate distension	28%	26%	41%
X-ray signs of closed loop	40%	50%	36%

that the X-ray findings apply to that proportion of cases only who underwent X-ray examination.

It should also be stressed that although the signs suggestive of closed-loop obstruction were not individually prominent, the *sum total* of such evidence indicated, or should have indicated, the presence of a closed loop in at least 70% of the cases reported in this series.

CONCLUSION

Space does not permit of a discussion of the distinctive radiological features or the differential diagnosis in these cases. The purpose of this paper is merely to present some of the patterns of strangulating bowel occlusions and to stress the fact that, since each individual symptom or sign is a variable factor, no constant or characteristic symptom pattern should be expected.

It should also be stressed that the term 'sub-acute obstruction' is a bad one except when applied to a stenosis of long standing. The mechanism of the vast majority of bowel occlusions is such that there is a constant threat to the blood supply of the affected loops, and vascular impairment may become complete within a very brief period.

In many of my cases where an incorrect diagnosis had been made this resulted largely from the fact that in the absence of *obvious* evidence of gut occlusion, the *possibility* of a strangulating lesion had not been thought of nor diligently looked for by the clinician who saw these patients in the first instance.

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THE EFFECT OF ASIAN INFLUENZA ON PREGNANCY

L. J. ABRAMOWITZ, M.B., CH.B. (CAPE TOWN), M.R.C.O.G., *Department of Obstetrics and Gynaecology, University of Cape Town*

In medicine negative findings are possibly as important as positive ones. Much has been written about virus infections and the effects on the foetus in early pregnancy. An opportunity for studying the effects of the virus producing Asian influenza was afforded when the pandemic reached Cape Town in August and September 1957. It lasted for about a month and was relatively mild, although in many cases patients ran high temperatures. The municipal health department of Cape Town recorded 8 deaths as being due to Influenza.[1]

An attempt has been made to assess the effects of this epidemic on pregnancy. The records of the maternity hospitals under the aegis of the University of Cape Town have been studied for 1957, chiefly with reference to the incidence of prematurity, stillbirths, neonatal deaths and antepartum haemorrhage. Also, 315 cases who had influenza in the first 20 weeks of pregnancy are compared with 414 controls. Unless patients were confined to bed for 1 or more days during the epidemic, they were not considered to have had influenza.

COMPLICATIONS

A prospective inquiry into the *abortion rate* during an epidemic is always difficult because so many cases with early pregnancies have not yet sought medical advice, and many are seen for the first time when they abort. At Groote Schuur Hospital the gynaecological wards admitted only emergencies during the peak of the epidemic, and more beds were available at that time for patients who aborted. The number of cases of abortion did not rise during August and September (Fig. 1). Although a few cases were seen in whom abortion occurred in association with influenza, and cause and effect seemed obvious, there was no appreciable rise in the abortion rate. Retrospective inquiry was made about bleeding in 76 cases who had influenza in early pregnancy and it had not occurred in any of these cases.

Among 315 cases who had influenza in the first 20 weeks of pregnancy, there were 3 minor *congenital abnormalities*. Among 414 controls there were 4 minor and 1 major abnormalities. This confirms Campbell's view[2] that influenza in early pregnancy does not produce congenital abnormality.

In Fig. 2 the monthly *prematurity rate* for 1957 is shown. During this period there were 7,632 deliveries. The incidence of *prematurity* did not rise in August or September. Among 315 cases who had influenza in the first 20 weeks, and the 414 controls, the incidence was 8·8% and 9·5% respectively.

As seen in Fig. 3, the *stillbirth rate* was not raised during the epidemic. In the cases who had influenza in early pregnancy, there were 4 stillbirths in 315 deliveries as compared with 4 in the 414 controls.

As seen in Fig. 4, the incidence of *neonatal deaths* did not rise in August and September. In the early group there were 2 neonatal deaths among the 315 cases who had influenza as compared with 2 in the 414 controls.

There was no increase in the incidence of *accidental haemorrhage* (Fig. 5).

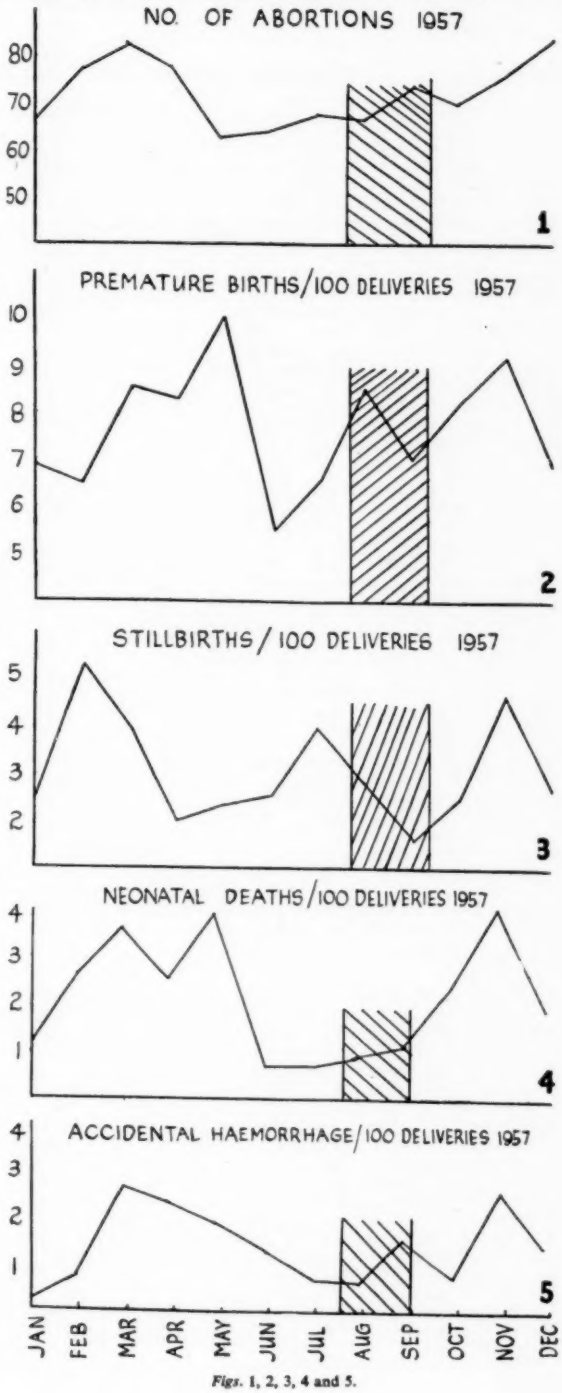
Where the sex of the infant was noted, it is interesting to observe that among cases who had influenza in early pregnancy the ratio of male/female births was 125/155 (i.e. 81 males per 100 females). In the control group the ratio was 216/206 (i.e. 105 males per 100 females).

Conclusions. From the evidence available it would appear that the effects of this epidemic of Asian influenza on pregnancy were negligible.

SUMMARY

The effects on pregnancy of Asian influenza, as it occurred in Cape Town in August and September 1957, were studied, with particular reference to abortions, congenital abnormalities, prematurity, stillbirths, neonatal deaths and accidental haemorrhage. The effects were negligible.

I wish to thank Prof. James T. Louw for allowing me to carry out this investigation and for his assistance; Dr. David Friedlander for his suggestions; and the Superintendents of the Groote Schuur,



Figs. 1, 2, 3, 4 and 5.

Somerset, Peninsula Maternity, Mowbray Maternity and St. Monica's Hospitals and the Matron of the Salvation Army Maternity Hospital, for their kind cooperation.

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NATIONAL GROUP OF NEUROLOGY, PSYCHIATRY AND NEUROSURGERY: PRESIDENT'S REPORT*

B. CROWHURST ARCHER, M.D., *President*

I should like first to express our thanks to Dr. S. Berman, of Cape Town, who attended the Congress of the World Federation of Neurologists in Brussels last year as the official delegate of this Group, and will represent us again at the next international meeting in Rome. It is now open to the neurologists of our Association to join the World Federation if they wish. Dr. H. Moross, too, has just returned from representing us at 3 international conferences. Your Committe has also been in close touch throughout the year with the World Health Organization, the World Federation for Mental Health, and the American Psychiatric Association.

Important work is being carried on by the International League against Epilepsy. The Executive Committee has acted on your behalf until a sub-group of the League has been formed within our Association. In the meantime you are asked to join the League individually and to send your subscriptions direct to the Secretary-General, Haarlem, Netherlands.

Administrative Psychiatry

In view of the importance of administrative psychiatry it was decided to invite the following persons now holding administrative appointments outside the mental hospitals, who had previously practised psychiatry, to become honorary members of the Group: Dr. A. P. Blignault (Assistant Editor, South African Medical Journal), Dr. J. H. Cairns (Dept. of Hospital Services, Cape), Dr. G. de V. de la Bat (Med. Supt., Kimberley Hospital), Dr. H. J. Hugo (Director of Hospital Services, Transvaal), Dr. J. H. McLean (Med. Supt., Provincial Hospital, Port Elizabeth), Dr. H. Rompel (Vereeniging Hospital, Transvaal), Dr. J. G. Steyn (Med. Supt., Frere Hospital, East London), Dr. A. H. Tonkin (Secretary, Medical Association of South Africa), Dr. D. A. van Binnendyk (Dept. of Public Health, Saskatchewan).

Mental Hospital Service

Every effort has been made to encourage the medical officers of the Mental Hospital Service to join the Group, but only relatively few replies have been received to our letters. It should be appreciated that there is nothing in the By-Laws of the Medical Association requiring that members of this Group must be on the specialist register. By-Law 21 states: 'Specialist Groups of Members having a distinctive professional interest may petition to Council for recognition . . .' I therefore appeal to all physicians of the Mental Hospital Service present to try and persuade their colleagues that we are here to help them and that they should join the Group and make it fully representative.

Memoranda

During the year a number of memoranda have been submitted to the Executive Committee for their consideration and comment.

1. *The need for a Commission of Enquiry into present mental health facilities and future needs of this country.* The Committee agreed that as the findings of the last Commission of Enquiry had been published as long ago as 1937 and that little had been done to implement its recommendations, there was now a real danger, if they were implemented in their present form, that the old *uneconomic* policy of custodial care and 'bigger and better hospitals' would become further entrenched. The Committee felt that this old report failed to take into account the effect of modern physical methods of treatment and the success of early-treatment centres as a practical means of reducing the present universal overcrowding in mental hospitals. The Committee therefore decided that this matter should be made the subject of a paper to be read at our Scientific Meeting in order to obtain the opinions of the Members of the Group.

2. *Salary scales and conditions of service in the Mental Hospital Service.* On enquiry the Committee found that this question was being investigated by the Department on account of the lack of suitable applicants for vacant appointments in the Mental Hospital Service. The matter was therefore considered to be *sub judice* but the Committee was prepared to reconsider the question after the findings of the Department had been made known.

3. *Better integration of Psychiatry into the general medical curriculum.* The Committee agreed that teaching in psychiatry should be on a par with that in other specialities and thus make for an all-round medical education. This implied not merely the spreading of the teaching over a longer period of the undergraduate course but also the integration of psychiatry with general medicine and a closer association of the teacher of psychiatry with teachers of the other several subjects. The Committee invited Dr. L. A. Hurst to read a paper on this subject but unfortunately, at the last minute, he had to decline on account of pressure of work. It is hoped that he will present this paper at the Medical Congress at East London next year.

4. *Diagnostic standards.* Some members of the Group have complained that their psychiatric diagnoses given on medical certificates, particularly when they are required by Government departments, have not be accepted. Investigation showed that there were misunderstandings on both sides about what was really required and the matter was referred to the Commissioner for Mental Hygiene for his advice. His recommendations were most helpful and a short memorandum on the subject will be circulated to the Group as soon as possible.

5. *Medical-aid scheme for doctors and their families.* On enquiry the Committee learnt that a pilot scheme was being worked out in the Transvaal. It was therefore decided to await developments, but in the meantime the Committee invited Dr. Alice Cox to read a paper on 'Neurosis in Doctors' Wives' which will provide an opportunity for a full discussion during our scientific proceedings.

6. *Correspondence.* In addition to these major issues a large volume of correspondence has been handled by the Hon. Secretary ranging from the intricacies of contract practice to problems relating to the admission to the specialist register.

College of Physicians, Surgeons and Gynaecologists

The first Faculty to be formed within the College of Physicians, Surgeons and Gynaecologists of South Africa was the Faculty of Neurology and Psychiatry.

The syllabuses of the Fellowship in Medicine with either Neurology or Psychiatry as a special subject, and the Diploma in Psychiatric Medicine, have been accepted by the Examination and Credentials Committee, passed by the Council of the College and submitted to the S.A. Medical and Dental Council for approval.

I am pleased to report that I have received an offer from a donor, who wishes to remain anonymous, of a capital sum of £10,000 in trust for the establishment of an overseas travelling fellowship in Psychiatry to be awarded at the discretion of the College every other year and valued at £500. I have also received a promise of a legacy of a further £10,000 for the College to establish bursaries to be awarded to selected outstanding graduates who wish to specialize in psychiatry but who otherwise might not be able to do so.

Medical Directory

Those of us who had to organize the Medical Congress last year in Durban experienced considerable difficulties on account of the lack of a comprehensive medical directory. I am glad to say that with our assistance and encouragement it is anticipated that the first medical directory in South Africa will be published early in the New Year.

Dr. Crowhurst Archer concluded with thanks to Dr. R. W. S. Cheetham (Hon. Secretary), Dr. M. Ginsberg (Vice-President) and Miss Myra Ovenstone (Committee Secretary).

* Delivered at the annual general meeting of the Group, Durban, September 1958.

42ND SOUTH AFRICAN MEDICAL CONGRESS, EAST LONDON, 27 SEPTEMBER — 3 OCTOBER 1959
42STE SUID-AFRIKAANSE MEDIESE KONGRES, OOS-LONDEN, 27 SEPTEMBER — 3 OKTOBER 1959

It has been decided to hold 3 plenary sessions at the East London Congress. The themes for these are (1) 'Cancer', (2) 'Tuberculosis Today', (3) 'Heart Disease' (*a*) Coronary Artery Disease, (*b*) Cardiac Surgery.

Doctors are reminded of the forms which were mailed to them and in which they were requested to indicate whether they would want to submit papers for Congress. Will all doctors interested in submitting papers please complete and return the forms mentioned before to Dr. Elizabeth McCabe, Organizing Secretary, 5 Belgrave Road, East London, before the end of January 1959.

Daar is besluit om op die Oos-Londense Kongres 3 voltallige sessies te hou. Die onderwerpe sal wees (1) ‚Kanker', (2) ‚Tuberkulose vandag', (3) ‚Hartkwaal' (*a*) Kroonslagaarsiekte, (*b*) Hartchirurgie.

Dokters word herinner aan die vorms wat aan hulle gepos is, en waarin hulle gevra is om aan te dui of hulle artikels vir die Kongres wil voorlê. Sal alle dokters wat belangstel in die voorlê van artikels asseblief die gemelde vorms voltooi en vóór die einde van Januarie 1959 aan dr. Elizabeth McCabe, Organiserende Sekretaresse, Belgrave-weg 5, Oos-Londen, terugstuur.

UNIVERSITY NEWS

PROFESSOR OF PSYCHOLOGICAL MEDICINE AND CHIEF PSYCHIATRIST, UNIVERSITY OF THE WITWATERSRAND

Dr. L. A. Hurst, Physician Superintendent at Sterkfontein Hospital, Krugersdorp, has been appointed Professor of Psychological Medicine and Chief Psychiatrist on the joint staff of the University of the Witwatersrand and the Johannesburg General Hospital. Dr. Hurst will take up this post, the first full-time Chair of Psychiatry in South Africa, on 1 January 1959.

Dr. Hurst, who is 47, was educated at the South African College School, Cape Town, and then became a student at the University of Cape Town where he received the degrees of B.Sc., B.A., M.B., Ch.B. In 1950 he received the degree of M.D. (with distinction) of the University of Pretoria and in 1952 a Ph.D. of the University of Cape Town. Dr. Hurst has been the recipient of 2 Fellowships—one a Commonwealth Fund Service Fellowship during which time he was stationed at the New York State Psychiatric Institute but travelled and studied widely throughout America and Canada. He also received a World Health Organization Fellowship during the tenure of which he continued his studies in America and also in England.

Dr. L. A. Hurst

Dr. Hurst is a member of the National Group of Neurologists, Psychiatrists and Neurosurgeons (M.A.S.A.), a member of the South African Psychological Association and was Vice-President of the Section of Neurology, Psychiatry and Neurosurgery at the 41st Medical Congress (M.A.S.A.) held in Durban in 1957. Apart from his position as Physician Superintendent of Sterkfontein Hospital, Dr. Hurst is Senior Lecturer and Clinical Lecturer in the Department of Psychiatry and Mental Hygiene of the University of the Witwatersrand, he is also honorary psychiatrist to the Mental Health Society of the Witwatersrand. Dr. Hurst was honorary psychiatrist of the Child Guidance Clinic at the University of Cape Town on 2 occasions, consultant in Psychiatry at the Pretoria General Hospital for 5 years, consultant in Psychiatry at the Voortrekkerhoogte Military Hospital for the same period and has been psychiatric adviser to the Krugersdorp Social Welfare Department and Marriage Guidance Council. He has been an examiner in Psychiatry at the Universities of the Witwatersrand and Pretoria and on the South African Nursing Council.

Dr. Hurst who has numerous publications to his credit has conducted research chiefly in the fields of psychiatric genetics and electro-encephalography.

OFFICIAL ANNOUNCEMENT : AMPTELIKE AANKONDIGING

AMENDMENT OF STANDING ORDERS

At the meeting of the Federal Council held in Pretoria on Thursday 2 October 1958, it was *resolved:*

1. That Standing Order 18 be altered to read:

'No business shall be transacted at a meeting other than that specified in the notice relating thereto, except matters which the Executive Committee shall recommend and matters agreed to be taken by Council by a two-thirds majority.'

2. That Standing Order 23 be altered to read:

'Any Branch, Group or member desirous of bringing any matter before the Council shall forward in writing to the Secretary at least 6 weeks before the date of the meeting due notice thereof in the form of a resolution accompanied by an explanatory memorandum. These shall be sent with the notice convening the meeting to all members of the Council and shall be considered in rotation with the other business to be brought before the Council.'

3. That a 'vote by poll' be defined as being one taken by a

WYSIGING VAN REGLEMENT VAN ORDE

Op 'n vergadering wat op Donderdag 2 Oktober 1958 gehou is, het die Federale Raad *besluit:*

1. Dat punt 18 van Die Reglement van Orde as volg verander word:

‚Geen sake, behalwe dié in die betrokke kennisgewing vermeld, mag op 'n vergadering behandel word nie, behalwe sake wat deur die Uitvoerende Komitee aanbeveel word en sake wat die Raad met 'n meerderheid van twee-derdes besluit om te behandel.'

2. Dat punt 23 van die Reglement van Orde as volg verander word:

‚Enige tak, groep of lid wat graag enige saak voor die Raad wil bring, moet behoorlike skriftelike kennis daarvan, in die vorm van 'n voorstel met 'n verklarende memorandum daarby, minstens ses weke voor die datum van die vergadering aan die Sekretaris gee. Hierdie voorstel en memorandum sal met die kennisgewing wat die vergadering belê aan alle lede van die Raad gestuur word en sal om die beurt met die ander werk wat voor die Raad gelê word, oorweeg word.'

3. Dat 'n ‚hoofdelike stemming' omskryf word as 'n stemming met getekende stembriefies en dat 'n ‚geheime stemming' om-

signed paper, and that a 'ballot vote' be defined as one which is secret, i.e. by unsigned voting paper.

By order of the Council,

A. H. Tonkin
Secretary

Medical House
35 Wale Street
Cape Town
14 November 1958

skryf word as 'n stemming wat geheim is d.w.s. met ongetekende geslote stembriefies.

Op las van die Raad.

A. H. Tonkin
Sekretaris

Mediese Huis
Waalstraat 35
Kaapstad
14 November 1958

PASSING EVENTS : IN DIE VERBYGAAN

Dr. J. Leibovitz, M.B., B.Ch. (Rand), D.A. (R.C.P. and S.), F.F.A.R.C.S. has commenced practice as a specialist anaesthetist at 301 Pan Africa House, Cor. Troye and Bree Streets, Johannesburg. Telephones: Rooms 23-2885, residence 25-5922, emergency 22-4191. These telephone numbers are not listed in the present telephone directory.

* * *

South African Paediatric Association. A meeting of the Cape Town Sub-group of this Association will be held on Tuesday 2 December 1958 in the Lecture Theatre, Red Cross War Memorial Children's Hospital, Rondebosch, Cape, at 8.15 p.m. The evening will take the form of a clinico-pathological conference arranged by Dr. David McKenzie, Pathologist, Red Cross War Memorial Children's Hospital.

* * *

College of Physicians, Surgeons and Gynaecologists of South Africa. In the temporary absence of the President, Prof. G. A. Elliott, the Examinations and Credentials Committee has appointed a Faculty Committee for Otorhinolaryngology, subject to confirmation or alteration by the President on his return. This Committee will consist of Drs. W. A. Kerr (Chairman), B. T. Bernstein (Secretary) and D. H. Klugman of Johannesburg, Dr. E. S. Meyrick of Pietermaritzburg and Dr. L. E. Lane of Port Elizabeth.

* * *

Dr. Louis A. du Plessis, M.B., Ch.B. (Pret.), Dip. Surg. (Rand), wens sy kollegas in kennis te stel dat hy as Torakschirurg begin praktiseer het. Spreekkamers, Florence Nightingale Verpleeginrigting, Kotzestraat, Hospitaalheuwel, Johannesburg. Telefoon: Spreekkamers 44-8837, woning 41-4090, noodoproepe 22-4191.

Mr. Louis A. du Plessis, M.B., Ch.B. (Pret.), Dip. Surg. (Rand), has commenced practice as a Thoracic Surgeon at the Florence Nightingale Nursing Home, Kotze Street, Hospital Hill, Johannesburg. Telephones: Rooms 44-8837, residence 41-4090, emergency 22-4191.

* * *

Research Form, University of Cape Town. Two meetings of Research Forum will be held in December in the large A-floor lecture theatre, Groote Schuur Hospital, Cape Town, and all interested are invited to attend:

1. On Wednesday 3 December at 12 noon, Prof. L. Eales and Dr. S. J. Saunders will speak on 'Treatment of nephrotic syndrome with steroids and diuretics'.

2. On Wednesday 10 December at 12 noon Dr. A. S. Truswell will speak on 'Measurement of the nutritional value of proteins for human adults and the effect of the enrichment of maize proteins'.

* * *

Treatment of Trivial Injuries by Specialists. It was reported at the recent meeting of the Federal Council that the Workmen's Compensation Commissioner had informed the Association's Workmen's Compensation Act Subcommittee that the policy of his Department in regard to the above matter is as follows:

'Every case where an injured workman consults a specialist directly, without first having consulted a general practitioner, is considered on its own merits. If the condition complained of is of a trivial or minor nature which could as well have been treated by a general practitioner, then the general-practitioner rates may be applied under Section 77 of the Act read with paragraph 6 (*a*) of the preamble to the scale of fees, which provides that if a specialist is consulted for a trivial injury general-practitioner rates only will be applied. If however, a specialist's attention is considered reasonable and warranted, the higher rates will be paid.'

The Workmen's Compensation Act Subcommittee recommended to Federal Council the acceptance of this policy, and Council agreed.

* * *

Correction. In the abstract of the article 'The Autopsy Incidence of Liver Siderosis in the Three Racial Groups of Cape Town', by Drs. Uys, van der Walt, Potgieter and Golby, which appeared on page 1115 of the *Journal* of 15 November 1958, a correction is to be made in the sentence beginning at the end of the first column. This should read 'Grade-C siderosis was present in 23·6% of European, in 26·5% of Coloured, and in 61·3% of Bantu subjects with siderosis'.

NEW PREPARATIONS AND APPLIANCES : NUWE PREPARATE EN TOESTELLE

MOBILE MASS X-RAY UNIT INDEPENDENT OF OUTSIDE ELECTRICAL SUPPLY

A completely self-contained mobile X-ray unit has been put in service by the South-West London Mass X-ray Service. The vehicle enables well over 60 people per hour to be examined, and is the first of its type to be commissioned.

It consists of a Karrier 'Bantam' 4/5-ton petrol-driven tractor and a special steel-framed semi-trailer, the two units being fitted with B.K. fully automatic coupling gear.

The prime mover, of the latest type, is carried on 25×6 tyres and is fitted with an extended chassis frame giving a wheel-base of 8 ft. 2 in. This extension provides sufficient space for an Auto Diesel 15 KVA diesel generating set to be transversely mounted immediately behind the cab.

The box-type semi-trailer, built by Eagle Engineering Co. Ltd. is of composite construction and measures 24 ft. 8 in. long by 7 ft. 6 in. wide by 8 ft. 6 in. high. It is detached from the vehicle when in use, is steadied by twin fixed-pivot jacks at the rear and twin detachable jacks at the front.

The unit is equipped with Shonander X-ray apparatus, and to enable the maximum number of patients to be handled there are entrance doors at the rear and near-side rear. Upon entry, patients are checked at a reception desk, whereupon they pass to an undressing area for the removal of their top clothing. From here, patients go forward to the X-ray apparatus and, after examination, they enter a dressing area where their clothes are waiting. They then leave through a double exit door on the near-side front side of the semi-trailer. In this way a flow system is achieved and waiting time reduced to a minimum.

Good interior natural lighting is provided by two Beclawat Boreas windows on the off-side and near-side together with a large safety-glass window in the near-side. In addition, 3 tinted Perspex panels are let into the roof. Artificial light is available from fluorescent strips. To provide adequate ventilation, twin 9-inch V 5-speed reversible Vent Axia fans are mounted in the roof, the fresh-air intakes being set into the vehicle sides at floor level.

The complete unit was supplied to the South-West London Mass X-ray Service by Rootes Limited, London.

'V-CILLIN K' (PENICILLIN-V POTASSIUM, LILLY) PEDIATRIC

Eli Lilly and Company introduce the new fast-acting oral penicillin for children—V-Cillin K, Pediatric—and supply the following information:

This preparation has won the highest rating ever given an antibiotic by Lilly's 'Junior Taste-Test Panel'. More than 100 young 'jurors' overwhelmingly approved the smooth, orange-coloured solution—particularly because it had no bitter after-taste. Thus, good patient acceptance is assured.

This new form of penicillin-V potassium retains the therapeutic advantages of tablets V-Cillin K. Therapeutic blood concentrations of penicillin are attained with in5-15 minutes and blood levels are higher than with any other oral penicillin. Bactericidal concentrations are assured.

V-Cillin K, Pediatric, is indicated for all infections known to respond to penicillin therapy. It is available in a dry, granular form for reconstitution as a solution. When mixed as directed each 5 c.c. (measuring spoon provided in package) will contain 125 mg. of Penicillin-V as the crystalline potassium salt.

Package size 40 c.c.

STEROID COMPOUNDS IN CANCER RESEARCH

The Olin Mathieson Chemical Corporation supply the following information:

Construction of pilot facilities for the production of steroid compounds to be used in cancer research has been announced by E. R. Squibb & Sons division of Olin Mathieson Chemical Corporation. The laboratory, to be located near the Squibb Institute for Medical Research at New Brunswick, New Jersey, USA, is the initial step in an accelerated program in cancer research involving an anticipated expenditure of 7 million dollars during the next 5 years. The long-range project will be financed jointly by Squibb and the Cancer Chemotherapy National Service Centre, which is a voluntary organization sponsored jointly by 6 private and government agencies, and devoted to the development and screening of chemotherapeutic anticarcinogens. The new programme has two major objectives: (1) to increase research on the interrelationship of endocrinology and cancer, and (2) to step up the production and the evaluation of steroid compounds in cancer.

A key to the development of new synthetic steroids was provided at the Squibb Institute for Medical Research in 1953 with the discovery of flurohydrocortisone, a halogenated steroid, by Squibb scientists Dr. Josef Fried and Mrs. Emily Sabo. This led to the development of other important synthetic steroids, such as triamcinolone, with greater activity than the naturally occurring form. Because of its experience in this field, Squibb was asked by the Cancer Chemotherapy National Service Centre to supply quantities of specific steroids, not otherwise commercially available, for its national cancer research programme. The new plant will provide steroids both for the Centre and for Squibb's own cancer research activities, which have been under way for more than a decade.

DERONIL (DEXAMETHASONE)

Scherag (Pty.) Ltd., P.O. Box 7530, Johannesburg supply the following information:

A little over 3½ years ago, Schering Corporation announced the discovery of Meticorten and Meticortelone. The introduction of these compounds and their acceptance by the medical profession completely revolutionized the field of corticosteroid therapy.

Now we are pleased to announce another significant development in corticosteroid research by Schering Corporation. A new compound, Deronil, with approximately 6 times the potency of the previously obtainable corticosteroids, is now available. Briefly, Deronil (dexamethasone) is a synthesized analogue of prednisolone with greatly enhanced potency and, as far as our studies indicate, a concomitant decrease in undesirable side-effects at therapeutic dosage levels.

We sincerely believe that Deronil will be found to be of definite value where corticosteroid therapy is indicated.

SOUTH AFRICAN IMPRESSIONS

Roche Products (Pty.) Ltd. have recently made available colour reproductions of 6 paintings by South African artists for free distribution to doctors throughout South Africa. The series is called South African Impressions, and includes the following:

1. *The Musicians* by D. A. Meerkotter. This is a very sensitive semi-abstract work in which lines, planes, textures and colour are planned in such a way as to give an aesthetic instead of a literary value.

2. *Harbour Scene, Durban* by Neil Sack. The harbour scene is an attractive, decorative impression of the characteristic bee-like activity which is such an essential part of Durban harbour and so dearly loved by the visitor.

3. *Drought in the Karoo* by Nina Alexander brilliantly captures the vibrant climate, the space, the temperament and the desolation of that wonderful expanse of land—the Great Karoo.

4. *Woman and Children* by Renee von Liebermann is the work of an artist who is basically interested in people. Her portrayal of this African family is characterized by a poetic, but nevertheless bold, approach to her subject and to reality.

5. *Old Farm House* by Nina Alexander gives a striking account of the essentially *rural* in this country—an old farm house with white-washed walls—untainted by the pseudo-sophistication of suburbia.

6. *The New Blanket* by D. A. Meerkotter. This is another semi-abstract work in which realism and abstract art are intimately interwoven. In this *one* picture is epitomized something of the great challenge which this country will have to face in future: the African, dressed in a pair of European trousers, but at the same time proudly wrapped in a bright new blanket.

REVIEWS OF BOOKS : BOEKRESENSIES

A HISTORY OF MEDICINE IN SOUTH AFRICA

A History of Medicine in South Africa. By Edmund H. Burrows, M.B., Ch.B. Pp. 390. Illustrations. Maps. 63s. (25s. for members of the Medical Association of South Africa). Cape Town and Amsterdam: A. A. Balkema. 1958.

It is some 10 years since the Medical Association decided that the time had come for a history of medicine in South Africa to be written. It realized that the best way to achieve this object would be to tackle the task itself through an author from amongst its ranks. The choice of Dr. Burrows was a wise one as he already had some books to his credit which showed him to be a painstaking investigator and an able writer. He was given every opportunity to go very fully into the records of the past and to take whatever time was necessary for the task. The result is a book of which both the Association and the author can be proud.

In dealing with his subject, Dr. Burrows has recognized that the history of medicine is bound up closely with the history of the country as a whole. The founding of the settlement at the Cape was for medical reasons and the first Governor was a medical man turned administrator, and since that time doctorshave played their part in the opening up of the country, in the fields of botany and geology, in the development of the diamond and gold industries and in the government of the country. Their influence is seen on every hand and is particularly shown in the great number of biographies which are interspersed through the pages of the book. These biographies are fascinating, as often one can trace through the generations names which are still found in South African medicine.

The copy of the book available to members of the Association is specially bound and should find a place of distinction on a South African doctor's bookshelves. It is a valuable piece of Africana, and while the price to the public is 63s. members are entitled to the specially bound volume at the low price of 25s.

A.H.T.

MEDICAL HISTORY OF THE SECOND WORLD WAR

Medical History of the Second World War. Army Medical Services. Campaigns. Volume II. Hong Kong, Malaya, Iceland and The Faroes, Libya, 1942-1943, North-West Africa. By F. A. E. Crew, F.R.S. Pp. xxxvii + 537. 66 Figures. XX Plates. 84s. net. London: Her Majesty's Stationery Office. 1957.

This volume of the History of the Army Medical Services of the Second World War contains the narratives of (1) the defence and fall of Hong Kong, (2) the campaign in Malaya and the fall of Singapore, (3) the military occupation of Iceland and the Faroes, (4) the final phase of the campaign in Libya from the battle of Alamein to the passage of the Eighth Army into Tunisia and (5) the campaign in North West Africa.

Of necessity, an account of this sort teems with maps, statistics, tables of rations, incidence of disease, details of the constitution and disposition of military formations. Therein, perhaps, lies its chief use to the professional or part-time soldier. Those, however, who are interested to learn of the capacity of man to endure in circumstances designed to degrade, of his ability to rise to heights of nobility, must read of the cohesion of spirit, the courage and the charity displayed by those captured in the fall of Malaya in the face of the insensate cruelty and stupid inefficiency of their temporary conquerors. Here they will be able to read factual accounts of how medical men, stripped of all modern diagnostic aids and therapeutic agents, flung back in time into the darkest of dark ages, worked and endeavoured to protect their charges whilst famine and pestilence stalked through the land decimating the population and bringing to an end all community life.

The section of the growth and work of the Army Psychiatric Service in the Middle East Force, gives a sympathetic account of the factors which precipitate psychological breakdown during war. It was distressing to learn that few medical men possessed the gift of leadership of the quality to sustain the morale in units composed, on the whole, of second-rate material physically and often mentally. One wonders whether the emphasis on the technical rather than the cultural side of professional training may not be, to some extent, responsible for this lack.

This book should accompany the previous volume on the shelves of all university libraries as well as those of military training units.

R.L.F.

YEAR BOOK OF NEUROLOGY, PSYCHIATRY AND NEUROSURGERY

Year Book of Neurology, Psychiatry and Neurosurgery, 1957–58. *Neurology*: Edited by Roland P. Mackay, M.D. *Psychiatry:* Edited by S. Bernard Wortis, M.D. *Neurosurgery:* Edited by Oscar Sugar, M.D. Pp. 624. 104 Figures. $8·00. Chicago: The Year Book Publishers, Inc. 1958.

Specialists in the three fields will accept this notice as advice that the *Year Book* has arrived and, if such is their custom, will obtain their copy, to use it either for rapid review of the year's literature or to find indication of papers they may have missed and would wish to read for themselves. An additional advantage which may be gained is that neurologists will learn of happenings in the psychiatric field, while psychiatrists and neurosurgeons also may not be content only to study their particular section of the book.

The 190 psychiatric pages to an unprepared reader may convey a scene of almost feverish scope and research activity. For the first time since World War II, there has been a decline during 1956 (and not the increase to be expected yearly) in the mental hospital population in the United States. This may be due to active treatments (tranquilizing drugs, psychotherapy or physical methods), or to the greater interest in the mentally ill shown by physicians and the public. There are now about 55 different types of tranquilizers; in 1957 the World Health Organization added this drug category to the list of habit-forming drugs. Zilboorg in a paper has warned that tranquilizers impair the full and free functions of the human ego. One report deals with a social psychiatric investigation of a section of New York, to show that severe mental disturbance has much to do with social class, being three times more common in the lower than the middle, and three times more common in the middle than the upper social class. Other researches investigate motor accidents; in air force drivers the accident-prone had relatively higher theoretical and aesthetic interests and relatively lower religious interests; furthermore, they were psychologically more complex than their non-accident fellows, less in harmony with their environment and less conventional. An interesting study investigates the effect of ward-rounds on patients, stressing the often-overlooked importance of respecting the patient's person and privacy; patients were upset by differences of opinion between doctors at the bedside (especially having their doctor scolded by his superior, a phenomenon statistically more common in surgical than in medical wards). The editor, Wortis draws attention to the recommendation of the British Committee on Homosexual Offences and Prostitution that homosexual acts between consenting adults in private be no longer considered a criminal offence. Numerous studies on brainwashing and political indoctrination are presented.

The section on neurology contains researches of great interest. There have been important findings about myelin formation. The Salk vaccine has had its great value further confirmed, and the newer oral vaccine of Sabin appears to confer immunity against poliomyelitis as durable as that of the actual disease. It is interesting to see that Sabin has also repeated experiments on which Russian workers based their claim to have found a pathogenic virus for multiple sclerosis. This claim is discredited: 'the Russian multiple sclerosis virus is rabies virus and has no relationship to multiple sclerosis.'

In the neurosurgery section, among the newest work are reports on the use in the treatment of parkinsonism of destructive lesions of the globus pallidus and, most recently, of the thalamus; the place of such operation is not yet confirmed.

H.W.

NON-VENEREAL SYPHILIS

Non-Venereal Syphilis—A Sociological and Medical Study of Bejel. By Ellis Herndon Hudson, M.D., D.T.M. & H. (Lond.), F.A.C.P. Pp. viii+204. 81 Figures. 30s. net+1s. 2d. Postage Abroad. Edinburgh and London: E. & S. Livingstone Ltd. 1958.

This work is an extension of the same author's monograph 'Treponematosis' issued by the Oxford University Press, New York, in 1946, being reprinted from Oxford Loose-Leaf Medicine.

Hudson, like several other medical men who have served in the United States forces, such as Butler and Holcomb, prefers the non-American view on the origin of syphilis. Hudson is the exponent of the theory that bejel (endemic syphilis) is not the same disease as venereal syphilis. He believes that the different forms of treponematosis had a common origin in the distant past and that the various present forms are caused by the influence through the centuries of environment and other factors.

Hudson states that yaws 'lost its clinical features when it left its torrid home and became endemic syphilis'. He apparently does not believe in reinfection or superinfection in endemic syphilis. He says 'if there was promiscuity in the rural areas it did not contribute to disease, because both men and women had become infected in childhood and were therefore incapable of infecting each other'.

Apart from these points Hudson's book is on conventional lines. He makes the interesting observation that the prevalence of endemic syphilis is inversely proportional to the population, whereas with venereal syphilis the opposite is the case. The bejel of the Euphrates valley is almost essentially a disease of childhood and associated with dirt and close living, flies and lice. Bedouin families share the hut with their domestic animals and the children are naked or scantily clad. Primary lesions were seen in Moslem townspeople but not at all in Bedouin peasants.

The book is well printed and very well illustrated, and the clinical description of bejel is excellent. Endemic syphilis is important to us in South Africa, and while isolated cases have been described, it appears to be common in Bechuanaland as J. T. Murray and others have shown in their report 'Endemic Syphilis in the Bakwena Reserve of the Bechuanaland Protectorate', reprinted from the Bulletin of the World Health Organization 1956. For the clinical descriptions and the illustrations this book is highly recommended, and Hudson's controversial theories are stimulating.

F.W.F.P.